SCIENTIFIC AMERICAN

[Entered at the Post Office of New York. N. Y., as Second Class Matter.]

A WEEKLY JOURNAL OF PRACTICAL INFORMATION. ART. SCIENCE. MECHANICS. CHEMISTRY AND MANUFACTURES.

Vol. XLIX.—No. 19. [NEW SERIES.] NEW YORK, NOVEMBER 10, 1883. $3.20 per Annum. [POSTAGE PREPAID.]

THE TRAVELING ELECTRIC LIGHT.

Aside from the ordinary applications of it, the electric light has permitted certain effects to be obtained that could not have been with the usual sources of light. Thus, for instance, the projection of a powerful luminous fascicle upon a given point that it is desired to illuminate brightly could not easily have been effected with oil or petroleum. Such a result, with these means of lighting, cannot be easily obtained without the use of bulky and cumbersome apparatus, snch as are applied only to fixed foci, like lighthouses.

For movable projectors the electric light alone is applicable. There is no need of recalling here the different apparatus of this kind that are used for army and navy purposes. They were represented at Munich only by a very simple apparatus, but one of quite large dimensions, which served to give certain intense effects of light in the interior of the Crystal Palace.

A more important arrangement, and one which contained some new features, was the lighting carriage of Messrs. Schuckert, Meisthaler & Co. In a certain number of cases it proves useful to be able to convey to a given place all the material necessary for an electric lighting, and so arranged that the lighting can be effected in a very short time. Such a necessity has given rise in military applications, for example, to vehicles designed to accompany the electric projectors. We have had occasion several times to speak of these apparatus in this journal. The one exhibited by Messrs. Schuckert, Meisthaler & Co. did not differ much from them. It consisted of a steam boiler and its water reservoir, and a four cylinder steam engine, which directly actuated a dynamo electric machine of the Schuckert system. But the interesting part of the apparatus was a second carriage, capable of being coupled to the rear of the first, and carrying a Piette & Krizik lamp, with the requisite arrangement for elevating it to a height of eight meters.

This ingenious arrangement was based upon the use of jointed parallelograms like those used by children for moving a whole army of toy soldiers, and which are called in Germany "Nürnbergsche scheere" (Nuremberg scissors).

The lamp support, or light tower, consisted of four of such apparatus, connected as shown in Fig. 2. When the apparatus is folded up for removal, it presents the aspect shown in Fig. 1. It is opened out simply by separating, along the grooves in the cross-pieces of the carriage, the four points that serve as a base to the system. The necessary distance apart is obtained by means of a screw actuated by a gearing and winch. The lamp is suspended at the upper part of the system by cords passing over pulleys, and, when the tower is lowered, it (the lamp) enters a cylindrical support placed in the center of the carriage, and this holds it in place while the latter is being moved about.

This apparatus was exhibited outside of the Crystal Palace, not far from the entrance to the exhibition. It was in operation before the public for several evenings, when the running of the machine was found to be regular and the light observed to be steady. Besides this, it was ascertained that it takes no more than five minutes to elevate the tower.

In order, however, to better judge of the apparatus from this point of view, it was taken on the 13th of October to one of the city squares, where, twenty minutes after the arrival of the two carriages, the machine was running, the tower was elevated, and the lamp was in operation. Despite a heavy rain, the light that was produced allowed a newspaper to be read at a distance of fifty meters. The apparatus, in short, seems to be very practical, and is certainly called upon to render services in certain military operations; for example, in that of throwing up earthworks, one that has to be done very quickly, and at which it is necessary to work day and night.

Another application of an arrangement of this kind upon which we cannot too strongly insist is that connected with work on the public streets. At Paris, for various reasons, almost all the work of this kind is done in summer, and the result is that there is considerable obstruction, due to the fact that the work is done at a large number of places at the same time. The use of apparatus like the one just described, by permitting of the work being performed at night, would fur-

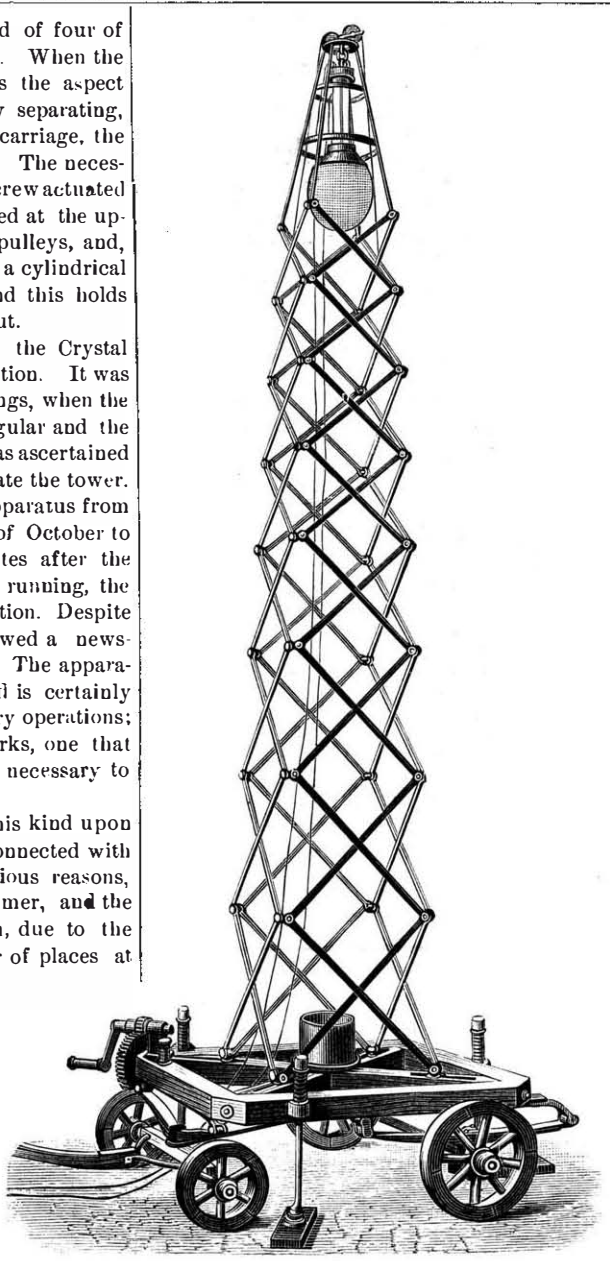
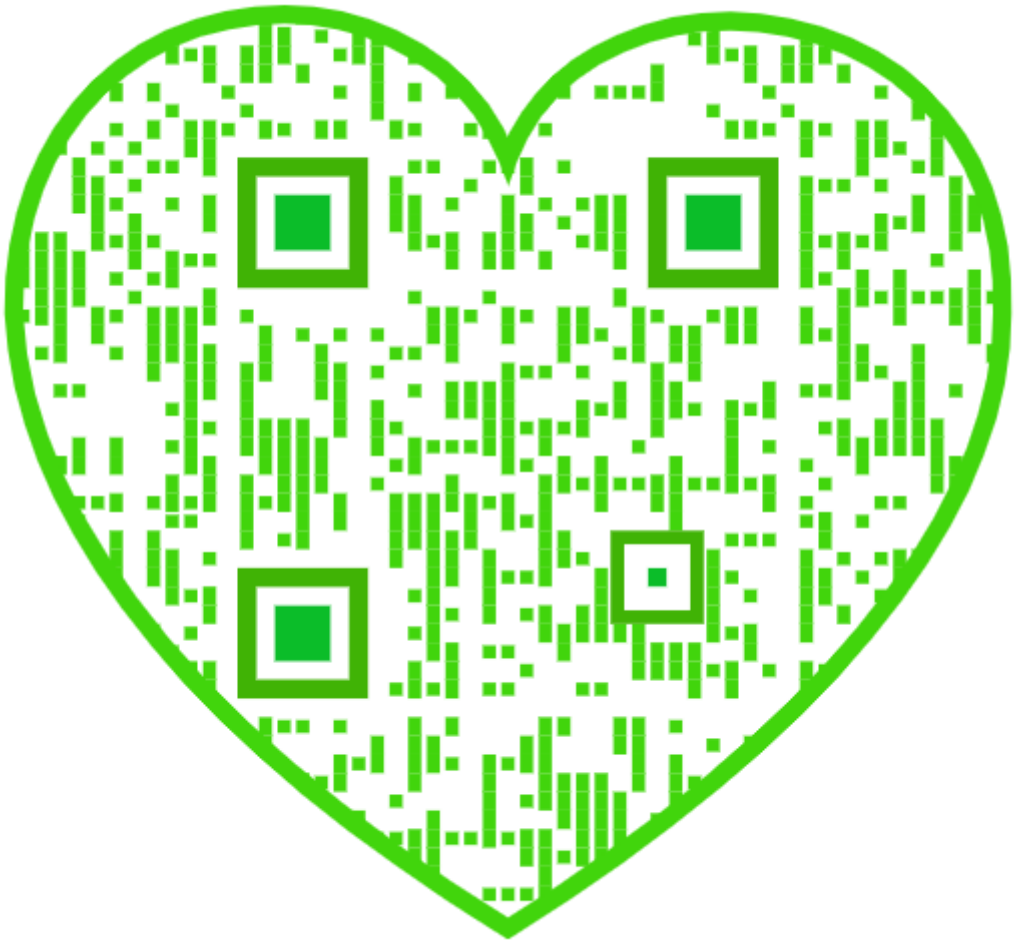


Fig. 2.—ELECTRIC LIGHT TOWER.

Fig. 1.—TRAVELING ELECTRIC LIGHT MACHINE AND LIGHT TOWER.

© 1883 SCIENTIFIC AMERICAN, INC



nish a means of diminishing, by one-half, the duration of each operation and consequently each local obstruction. But since, on another hand, the work as a whole to be effected would take half the number of days by night work, half of it might first be done in the same period of time, and then the rest of it, and the general obstruction of the city would be reduced to a quarter, while at the same time lasting as long as at present. There would certainly be some expense connected with the organization of a plant of this kind, but would not this be made up by the greater rapidity with which the work would be performed? For it is certain that work performed in a continuous manner, by gangs of men that relieve one another, will be finished more promptly than if it were discontinued and begun again every day. With night work, the bridge Des Saints Peres would have now been given up to travel, while as it is it will be closed for a long time to come.

Incident Relating to Professor Atwater.

A memorial of the late Professor Lyman H. Atwater, of Princeton College, who died last June, has just been published. In the memorial sermon of Rev. Wm. M. Taylor the following incident is related: At the beginning of Dr. Atwater's final illness he would lie for hours as though asleep. After his partial convalescence he said to members of his family that when they had, doubtless, thought him to be sleeping he was in reality thinking with unusual energy; that his mind seemed stimulated to extraordinary acuteness on very profound subjects, reaching with great rapidity conclusions which in health would have been arrived at only after much longer thought. He added that he would like to get well enough to put some of those thoughts on paper, but he never gained his wish.

To Raise Plants.

A lady, whose beautiful plants are the delight of her life and the envy of all her acquaintances, revealed the secret of her success for the benefit of the readers of the *Evening Post* the other day. The soil is, she says, about two-thirds good garden soil, and the rest is sand. It is kept light and loose about the roots; they are watered as they appear to need it, and not according to any particular rule; but the chief reason for their wonderful growth and bloom is this: "When any of the leaves wither and fall, instead of picking them up and throwing them away, I make little rolls of them and tuck them down in the earth and let them decay; and this is the only fertilizer I have ever used. This," she added modestly, "seems to be nature's way. And the plants that have the afternoon sun only, grow and rival those that have the morning sun."

Death of Dr. Gale.

Dr. Leonard D. Gale, an old well known scientist, and for a number of years an examiner in the chemical class at the Patent Office, died in Washington on October 23, at the age of eighty-three. He was a great friend of Prof. Morse, and assisted him in building the first telegraph line between Washington and Baltimore. Dr. Gale went to Washington in 1846, and has since resided there. It was said in the early days of the electric telegraph that Prof. Henry's discoveries in electricity contributed very much to Prof. Morse's success, and that Dr. Gale was the mutual friend of both.

More than thirty years ago the writer became acquainted with Dr. Gale while an examiner in the Patent Office. He was greatly respected by his associates and those having official business in his department at that time.

Vegetable Wool.

The *Moniteur des Fils et Tissus* calls attention to a description of vegetable wool called *Kapoc*. It comes from Java, and a specimen is on view at the Amsterdam Exhibition. It arrives at Amsterdam in its leathery covering, being itself enveloped in the seeds. It is then freed from both, and is carded so as to make a very light mattress wool, worth about 8¾*d.* per pound. One of the houses engaged in this operation had made trials in spinning and dyeing this material, but the filaments are said to be like strings, and their industrial application consequently a matter of uncertainty.

A Car Load.

Nominally a car load is 20,000 pounds. It is also 70 barrels of salt, 70 of lime, 90 of flour, 60 of whisky, 200 sacks of flour, 6 cords of soft wood, 18 or 20 head of cattle, 50 or 60 head of hogs, 90 or 100 head of sheep, 9,000 feet of solid boards, 17,000 feet of siding, 13,000 feet of flooring, 40,000 shingles, one-half less green lumber, one-tenth less of joist, scantling, and other large timbers, 340 bushels of wheat, 400 of barley, 400 of corn, 680 of oats, 300 of flaxseed, 366 of apples, 340 of Irish potatoes, 300 of sweet potatoes, 1,000 bushels of bran.

The Patriarch Chemist.

On September 1, M. Chevreul, the Nestor of chemists, completed his ninety-eighth year of age. He was born at Angers, in the night of August 31, 1786. At the early age of 20 years he was conservator at the Museum. Among his great discoveries in chemistry, figure prominently the separation of the fat bodies and the chemical constitution of oleine, stearine, and margarine. To him is also due the doctrine of the contrast of colors, of their shades, and of the determination of shades.

Scientific American.

ESTABLISHED 1845.

MUNN & CO., Editors and Proprietors.

PUBLISHED WEEKLY AT

No. 261 BROADWAY, NEW YORK.

O. D. MUNN. A. E. BEACH.

TERMS FOR THE SCIENTIFIC AMERICAN.

One copy, one year postage included..... $3 20
One copy, six months postage included 1 60

Clubs.—One extra copy of THE SCIENTIFIC AMERICAN will be supplied gratis for every club of five subscribers at $3.20 each · additional copies at same proportionate rate. Postage prepaid.

Remit by postal order. Address

MUNN & CO., 261 Broadway, corner of Warren street, New York.

The Scientific American Supplement

is a distinct paper from the SCIENTIFIC AMERICAN. THE SUPPLEMENT is issued weekly. Every number contains 16 octavo pages, uniform in size with SCIENTIFIC AMERICAN. Terms of subscription for SUPPLEMENT, $5.00 a year, postage paid, to subscribers. Single copies, 10 cents. Sold by all news dealers throughout the country

Combined Rates.—The SCIENTIFIC AMERICAN and SUPPLEMENT will be sent for one year postage free, on receipt of *seven dollars*. Both papers to one address or different addresses as desired.

The safest way to remit is by draft, postal order, or registered letter. Address MUNN & CO., 261 Broadway, corner of Warren street, New York.

Scientific American Export Edition.

The SCIENTIFIC AMERICAN Export Edition is a large and splendid periodical, issued once a month. Each number contains about one hundred large quarto pages, profusely illustrated, embracing: (1.) Most of the plates and pages of the four preceding weekly issues of the SCIENTIFIC AMERICAN, with its splendid engravings and valuable information; (2.) Commercial, trade, and manufacturing announcements of leading houses. Terms for Export Edition, $5.00 a year, sent prepaid to any part of the world. Single copies 50 cents. ☞ Manufacturers and others who desire to secure foreign trade may have large, and handsomely displayed announcements published in this edition at a very moderate cost.

The SCIENTIFIC AMERICAN Export Edition has a large guaranteed circulation in all commercial places throughout the world. Address MUNN & CO., 261 Broadway, corner of Warren street, New York.

NEW YORK, SATURDAY, NOVEMBER 10, 1883.

Contents.

(Illustrated articles are marked with an asterisk.)

Adjustable pipe wrench*	296	Notes and queries	297
Agricultural inventions	297	Novel Russian boat*	294
Aluminum	290	November meteors	288
Ancient ruins in Sonora, Mexico.	295	Oil for wagon wheels	289
Another electric railway	260	Ostrich farming in this country	289
Boride of aluminum	295	Paper pulp from cedar bark	292
Business and personal	299	Patriarch chemist, the	288
Butter box, Sweatt's*	290	Plants, to raise	288
Car load, a	288	Prof. Atwater, incident relating	288
Caoutchouc, new source of	296	Proposed new pipe line	296
Churn, Hay's improved*	290	Pulse of animals	294
Death or Dr. Gale	288	Rainbow in a clear sky	296
Decisions relating to patents	289	Recording telephone, a	293
Digestibility of meats	296	Re-enforcement of well water*	292
Emulsion petrol, an insecticide	294	Rigg's improved fence*	296
Engineering inventions	267	Ringed adders from eggs*	295
Electric fire alarm*	290	Spontaneous combustion	294
Electric launches	289	Standard of education	296
Electric light and tower*	287	Storage of wind power	293
Electro dynamic motor*	291	Substitution of steel for iron	288
Fast railway time	293	Suggestions to inventors	294
Hay's improved churn*	290	Sweatt's butter box*	290
Hydraulic pile driver*	294	Taylor's adjust. pipe wrench*	296
Index of inventions	299	Tehuantepec ship railway	293
Inventions, new	297	Tobacco in France	289
Iodide of nitrogen	292	Traveling electric light*	287
Java earthquake and telephone	294	Uninflammable paper and wood	290
Long life, to attain	292	Use of standard gauges	293
Lucilia macellaria	293	Varnish	295
Mechanical inventions	297	Vegetable wool	288
Metal castings of insects, etc	295	Wasteful use of water	290
New books and publications	297	Water in wells, re-enforcement*	292
New process steel	290	Water test	294
New test for oxygen	290	Wheelman's horse, the	293
Nordenskjold's exploration	296		

TABLE OF CONTENTS OF

THE SCIENTIFIC AMERICAN SUPPLEMENT

No. 410,

For the Week ending November 10, 1883.

Price 10 cents. For sale by all newsdealers.

PAGE

I. ENGINEERING AND MECHANICS.—Automatic Fire Extinguisher. 6537
Bridge over the Yazoo River for the Louisville, New Orleans, and Texas Railroad.—Nature of the banks and bottom of the Yazoo at the site of the bridge.—Description of construction.—Several figures 6537
English Locomotive.—With full description and engraving 6538
Fusible Plugs: A Preventive of Disasters Caused by Low Water in Boilers.—Engraving 6538
New Pocket Revolver.—Several engravings 6539
The Inclined Plane and Elevating Apparatus at Briancon.—Construction of the plane.—The cars used and manner of running them.—Numerous figures 6539
Perpetual Motion.—Showing the impossibility of producing perpetual motion, as generally understood.—2 engravings 6541
An Improved Pyrometer 6541
Explosion of War Rockets, Woolwich Arsenal.—With several engravings, showing the construction of war rockets 6543

II. TECHNOLOGY.—Phytochromotypy, or the Production of Prints of Plants.—Giving the processes used.—1 engraving 6542
Slate Fences.—Manner of erection, cost, etc.—With descriptions and illustrations of several kinds of fences 6542
Rubber Tires for Vehicles.—2 figures 6543

III. ARCHITECTURE.—House, Mottingham Park, Eltham.—With engraving 6542

IV. ELECTRICITY.—Application of the Electric Light in Theaters.—Treating of the advantages of electric over gas light in relation to the light effects which can be produced, and the danger from fire.—Several engravings 6535
Bleaching by Electricity.—4 figures 6536

V. NATURAL HISTORY.—Heath's Bolivian Explorations. By Rev. J. D. PARKER.—Former attempts to explore the Beni River.—Description of Dr. Heath's voyage on the same 6547
Explorations in Guatemala made by A. P. Maudslay 6548
The Singing Beach of Manchester, Mass. By A. A. JULIEN and H. C. BOLTON 6549
The Foehn of Greenland.—Cause of this wind 6549

VI. ARCHÆOLOGY.—The Earliest Map of London 6545
History of Navigation.—With descriptions of marine vessels used in different ages and numerous illustrations of the same 6546

VII. HORTICULTURE.—Mimulus Cupreus Brilliant.—With engraving 6549
The Twin Flower (Linnæa Borealis).—With engraving 6549
The Spread of Epidemic Diseases in Plants. By W. G. FARLOW. 6549

VIII. MISCELLANEOUS.—Base Ball Science.—With diagrams illustrating curves described by the ball 6545
Physics Without Apparatus.—Experiments on center of gravity and equilibrium.—2 engravings 6545
Magic Rings.—An Optical illusion.—1 engraving 6545
A New Fish-Hatching Apparatus. By VON LA VALETTE ST. GEORGE.—With description and 3 engravings 6550

SUBSTITUTION OF STEEL FOR IRON.

Builders of machinery and machine tools are rapidly substituting low steel for refined iron in the parts of machines subjected to strain, and yet requiring stiffness. Low steel is extensively used in drop forging, and for many objects is preferred to Norway or Swedish iron. It will bear as soft heating, leaves cleaner lines, and is superior in stiffness, although it is exceedingly tough and fibrous. For piston and valve rods, for small finished shafts, rod connections, and many other uses heretofore filled by iron, steel is now generally preferred. When well made and rolled or hammered into rods and small bars, the toughness of this sort of steel is remarkable; a specimen recently noticed being a bar seven-eighths of an inch in diameter, doubled cold, and the bend hammered flat under a heavy atmospheric hammer without breaking the fibers. But one of its best qualities is its rapidity of being worked, and the cleanliness of the job.

The steel is measurably pure, containing no "sand bars," or spiculæ of hard iron, that either take the edge off the turning tool or the planer cutter, or break the points off. The cutter may be set to size in a lathe or on a planer, and the steel works so even that the calipers or the try gauge is scarcely required for a run of several feet continuously. This steel is admirably adapted for the feed screws of lathes, particularly for screw cutting lathes; the thread being cut so clean that it will gauge to the one-hundredth part of an inch before taking the scraping or finish chip. The durability of steel as compared with iron is so much greater that the value of the rolling and sliding parts is largely enhanced, and fits can be made with much closer accuracy, while the increased first cost of material is nearly, if not quite, made up in the greater facility of working.

NOVEMBER METEORS.

The earth will break her way through the November meteor-zone about the 13th of November, and proof of her passage will be furnished by the appearance of a few meteors proceeding from the constellation Leo at the time indicated. The meteor-zone is so broad that it takes the earth two or three days to traverse it, and the nights of the 12th, 13th, and 14th are the times to watch for the meteors. It will be necessary, however, to wait till 1899 for a grand star show, as this immense group of tiny atoms travels in an ellipse of such vast dimensions as to require 33¼ years to complete a revolution. The reason we do not have a star shower every November is because the meteors, instead of being uniformly distributed throughout the zone, are principally collected in a great group in one part of it. If the earth crosses the zone at a time when the principal group is in the part she is crossing, we have a shower that forms one of the most grand and brilliant sights ever seen on this planet. About a dozen of these magnificent November showers are on record. The Chinese, Arabian, and other historians have handed down many accounts of the wonderful meteoric showers. An Arabian writer reports: "In the year 599, on the last day of Moharrum, stars shot hither and thither, and flew against each other like a swarm of locusts; this phenomenon lasted until daybreak; people were thrown into consternation, and made supplication to the Most High; there was never like seen except on the coming of the messenger of God, on whom be benediction and peace."

In 1799 Humboldt, then traveling on the Andes, saw before sunrise thousands of meteors in the space of four hours, leaving a track behind them from five to ten degrees in length, many of them having a nucleus as bright as Jupiter. In 1833 there was a shower marked by grandeur and sublimity. The meteors passed over the heavens like flakes of snow, and, according to Arago's estimation, two hundred and forty thousand of them fell in three hours, as seen from his place of observation. In 1866 the latest shower was observed in Europe, and a portion of it was seen in America in 1867. The next shower is due in 1899, and is eagerly anticipated in the hope that it will confirm several theories based upon present and previous observation.

The November meteors have a curious and interesting history. It was found by Tempel, of Marseilles, in 1865, that a faint telescopic comet was moving in the same orbit, and that the meteoric showers are caused by the earth's encountering a swarm of particles following Tempel's comet. In other words, the comet is slowly disintegrating, and being transformed into meteors that will eventually fill the whole zone, when the grand showers will cease, and a display of greatly smaller proportions will take place every year.

The history of the November meteor-zone is a romance of meteoric astronomy. According to Leverrier—and some portions of his theory need confirmation—about the year 126 of the Christian era, Tempel's comet passed so near Uranus that the powerful attraction of the planet bent it from its former course and imprisoned it within the bounds of the solar system, causing it to describe an immense ellipse or gigantic hoop, whose aphelion lies beyond the orbit of Uranus, and whose perihelion rests upon the earth's orbit. The time intervening between the great showers, 33¼ years, proves the period of the revolution of the meteor-zone. It is only at these intervals that the earth crosses the brightest portion of the zone, consisting of the nucleus of the comet and swarming meteors into which it is being transformed. The November meteors start from a point in the constellation Leo, and are for this reason called Leonids. Leo is favorably situated for observation about 3 o'clock in the morning, which is a good time for picking up the few stray meteors, which, impinging against the earth's atmosphere,

© 1883 SCIENTIFIC AMERICAN, INC

will be set on fire by the concussion and take on the form of falling stars.

It is, however, unnecessary to wait for the earth's passage through the November meteor-zone to witness the phenomenon of a falling star. Hundreds of other meteor-groups have been observed, which, excepting the August group, are not so well defined. They are all extremely diverse, and they cross the plane of the earth's orbit at widely different angles. Consequently on any clear night falling stars may be seen to blaze forth suddenly in the sky, rush on their headlong course, and then disappear, leaving oftentimes a train of light to mark their course. Instances are on record where falling stars were of such brilliancy as to be visible in the daytime even, when the sky was overcast.

A surprising number of these tiny bodies fall through the atmosphere every day. The average number of those sufficiently bright to be seen at night with the naked eye is no less than seven millions every twenty-four hours. If we include the number visible through a telescope, the average must be increased to four hundred millions. Interplanetary space swarms with meteoric matter! The work accomplished by these systems made up of innumerable atoms of cosmical dust, their origin, the part they play in the economy of the universe, and their mysterious association with comets, are questions of the deepest interest to astronomers.

OSTRICH FARMING IN THIS COUNTRY.

The ostrich farm in California is reached over a sandy road leading from Anaheim, part of the way being over the old bed of the Santa Ana River. The land on which the farm is located comprises640 acres of alkali soil. The same kind of soil is found in Africa, and it was considered no obstacle. To rid it of its alkaline properties, it was plowed very deep and water turned on it, a well 300 feet deep yielding many thousands of gallons of water a day. The water was allowed to remain for a while, when it was drawn off, taking with it a portion of the alkali in solution. This operation was continued until the land had been washed sufficiently to be put under cultivation. According to the San Francisco *Bulletin*, this farm has yielded three crops of alfalfa, and a fourth is ready to be cut.

The twenty-one birds on the farm were brought, in a roundabout way, some 22,000 miles, part of the distance by car. When young they are kind and tractable, but after three years become vicious and deceitful. Blindfolding them —generally accomplished by pulling a stocking over their heads—takes away their pugnacity, and they will not kick, except they know what they are kicking at. The eggs are not fruitful because, the owner states, the birds are becoming acclimatized. Even if all attempts to hatch the eggs should prove unsuccessful, the value of the feathers will cover the expense of tending the birds for the year.

The attempt to raise ostriches in Florida has just been commenced, three pairs of birds having been taken there.

Ostrich eggs are about six inches long by five wide, and are equal in bulk to 24 hens' eggs. The chick is hatched in 42 days, and a few days after reaches the size of a common hen. A light brown down covers it, and at the back and wings are projecting needles, similar to those of a hedgehog. At the age of one month the size of a turkey is reached, and small feathers begin to appear. At one-half a year the feathers have attained a good size, but are not cast off until the bird becomes a yearling; young ostriches are kept in flocks of from twelve to fifteen, and seprate from the old ones. Generally the feathers are cut off only once a year, but birds which receive special attention yield two or even three crops of feathers.

The best feathers now come from North Africa, but the crop is insignificant compared with that of Cape Colony, Natal, and the Transvaal. Since 1862, ostrich farming has greatly multiplied in those countries, and it is now estimated that there are 100,000 domestic ostriches which yield feathers worth $4,500,000.

TOBACCO IN FRANCE

The report of Consul B.F. Peixotto, of Lyons, France, gives a brief history of tobacco in France and the value of that industry to that government. In 1560, Jean Nicot, a French explorer who had been Ambassador to Portugal, and had traveled in the Antilles, conceived the idea of collecting in the island of Tabago, one of the isles of the Archipelago, a plant of which the natives dried the leaves and chewed. He carried some seeds to France and planted them in his garden. He propagated it as an exotic curiosity, no one dreaming of making the repugnant use of it as did the savages. A long time after, when intercourse with the New World had become more frequent, travelers learned the use of the weed and imported its taste into Europe. Tobacco was then devoted to smoking, and in a powdered state was taken as snuff. The practice obtained royal favor, and became popular with the nobles.

The first tax was the result of a royal decree dated November 17, 1629. At first it was a custom tax, but later it was a direct impost upon the apothecaries, who had an almost exclusive monopoly for its sale. But as the apothecaries sold largely and reported very little, the tax was insignificant in amount. The King then took possession of the manufacture and sale of all tobacco, the ordinance dating from September 29, 1674. Thus the druggists gave way to contractors who would pay no more than 500,000 francs per annum for the monopoly. The privilege increased in value until it became, in 1697, 1,500,000 francs, and in 1715 it reached 2,000,000 francs. In 1790, the consumption having become so great, the monopolists willingly paid 30,000,000 francs.

From 1791 to 1798 all tax was removed. Then the plan of permitting its culture but taxing the sales was tried without success, and on December 29, 1810, the government monopoly was resumed, and has been continued to the present time. By this law the administration is alone charged with the purchase of leaves and cigars from home and foreign cultivators and manufacturers, and with the manufacture and trade of tobacco in all its forms.

The revenue from tobacco in 1820 was 64,338,834 francs, and in 1882 it was 362,594,000 francs, or 1,000,000 francs per day. This enormous sum contributes toward the budget of public instruction.

DECISIONS RELATING TO PATENTS.

In the United States Circuit Court, Southern District of New York, Fetter *vs.* Newhall, Drive Screw, Patent 110,839; reissued March 12, 1878, No. 8,121. Judge Wheeler held the patent to be in part valid. Also that it is not necessary to take the whole of a patented invention to constitute an infringement. The patent gives exclusive enjoyment of the whole patented invention, and taking one feature is an infringment *pro tanto*.

Where a defendant has repudiated a license formerly held by him, and is acting in defiance of the patent and outside the license, such license is no protection against suit for infringement.

An interesting question came up on this trial relative to the rights of minors and women to receive, hold, and convey patents. The Judge held as follows:

The laws of Congress give the right to a patent to the inventor, whether *sui juris* or under disability, or to the assigns of the inventor. As inventor or assignee of a patented invention a married woman, an infant, or a person under guardianship obtains a vested right to the patent. Married women could always take by assignment under the common law.

Section 4898 Revised Statutes requires that the assignment of a patent be by an instrument in writing. The ability to make the instrument, however, or the aids to a disability must be found in the laws of the States, where all such rights are regulated.

The laws of New York free married women from disability to make an assignment by an instrument in writing, and make their property distinctively their own. Where a married woman by her sole deed assigns an interest in a patent the assignment is valid, and she may join with such assignee in an action involving their joint rights.

An interesting decision touching the right of towns and other State authorities to tax the sellers of patented goods, was given by Judge Cooley, of the Supreme Court of Michigan, in the case of the People *vs.* Russell.

An ordinance of the city of Coldwater provides, among other things, that "no person shall hawk or peddle any meat, goods, wares, or merchandise from door to door within the limits of the city of Coldwater, without a license from the mayor." For the license, when not for the sale of meat, fifteen dollars is required to be paid for one year, or three dollars for one day. The defendant was convicted under this ordinance, on evidence that, without license, he traveled from door to door in said city and sold a clothes wringer. The clothes wringers were manufactured by the defendant at Sturgis, in this State, under letters patent of the United States issued to him and one Shepardson as patentees. The defendant appealed.

The Judge in delivering the opinion of the court, said:

It is objected to the ordinance that if applied to the sale of patented articles it is an interference with the power of Congress to grant exclusive rights to patentees to make and sell their inventions, and an encroachment upon the rights which the patent assures to the patentees. We agree that if this is the case the ordinance can have no such application. The power of Congress to grant the exclusive right to make and sell the articles which from their originality and value have been found deserving, is exclusive, and any State legislation which undertakes to limit or restrict in any manner the privileges which the letters patent confer is an invasion of the sphere of national authority, and therefore void. This was shown in Cranson *vs.* Smith, 37 Mich., 309, and what is said there need not be repeated. But the ordinance in question does not assume to interfere with or in any way to abridge the exclusive rights which the patentee may lay claim to under his patent. The ordinance is a police regulation, made under the general police authority of the State, and taking no notice of this or any other patent, or of the way in which any salable commodity may have come into existence. It is one of the customary regulations for a business. It is well settled now, if it was ever doubted, that any ordinary exercise of congressional authority does not take from the State any portion of its general power of police. (Pervear *vs.* Commonwealth, 5 Wall., 475.) The acts of Congress assume the existence of State regulations, and in many respects would prove inoperative and confusing if it were otherwise. The patent laws are as forcible for illustration as any other; they give exclusive rights, but they do not determine personal capacity to contract or prescribe the requisites for sales of patented articles or impose the customary restrictions which are supposed to be important to the protection of public morals. All these matters are left to the State Law. A patentee must observe the Sunday law as much as any other vender; he must put his contracts in writing under the same circumstances which require writings of others, and he must obey all other regulations of police which are made for general observance. (Patterson *vs.* Kentucky, 97 U. S., 501.) Invidious regulations applicable to patentees exclusively might be void; but there is no question of that nature here. We have no doubt that it was competent for the State to confer upon the city the power to pass such an ordinance. That the regulating of hawkers and peddlers is important, if not absolutely essential, may be taken as established by the concurring practice of civilized States. They are a class of persons who travel from place to place among strangers, and the business may easily be made a pretence or a convenience to those whose real purpose is theft or fraud. The requirement of a license gives opportunity for inquiry into antecedents and character, and the payment of a fee affords some evidence that the business is not a mere pretence.

Judgment affirmed.

Electric Launches.

At the recent meeting of the British Association, Mr. A. Reckenzaun read a paper "On Electric Launches." He described the boat Electricity. It has one Siemens D_2 dynamo connected directly to the screw shaft, upon which is a propeller with two blades; diameter 17¾ inches, pitch 11½ inches, and area of blade surface 66 square inches. Yarrow and Company, in conjunction with the Electrical Power Storage Company, have fitted up a launch, which has been sent to the Vienna Exhibition. This is 40 feet long by 6 feet beam, and can carry forty passengers. The motor is a Siemens D_2 machine, which develops 7 horse power with 80 cells, and a current of 40 amperes. The screw is two-bladed of thin forged steel, with a diameter of 19 inches, and a pitch of 13 inches. The weight of the motor and batteries combined is 2¼ tons. During the trial the speed of the boat was over eight miles an hour, the current used at the time being 41·22 amperes, and the counter electromotive force 112·5 volts, with 60 cells in circuit.

Mr. J. Clark, of Glasgow, described a wooden boat, clinker built, 21 feet long over all by 4 feet 4 inches beam, and drawing 12 inches of water with three or four persons on board. She is fitted with an electric motor coupled direct to the propeller shaft, and her power is derived from two battery boxes 3 feet long by 8 inches wide, and 12 inches high, which can be utilized as seats. The batteries require recharging with chemicals about every four hours of continuous use, one battery driving the boat at three-quarters speed, while the other is being recharged. During several trials at Kilcreggan-on-Clyde, a speed of a little over five miles an hour was obtained, the motor running at 600 revolutions per minute. The weight of the boat complete, with batteries charged, is 4 cwt. Clark's electric launches are now being built by Messrs. Gilbert Bogle and Co., of Glasgow, of varying sizes, from 15 feet long and four miles per hour speed to 30 feet long and seven miles per hour speed. The author gave no clew as to the nature of his batteries or to the cost of working them.

Sir William Siemens said that there were many applications in which the secondary battery would be most useful, but it was a mistake to suppose it could be employed for every purpose. For instance, it was foolish to endeavor to adopt them for driving tricycles, but in launches, where the machinery was perforce very cramped, they promised excellent results. The great question was whether the secondary battery would last or whether it would perish. In order to test this point quietly he had put down batteries in his own house last autumn, and he had found them satisfactory so far. He charged them all day, and at night he used both them and a small dynamo to feed his lamps. In the case of a launch the machine could not be taken with the boat, and consequently the navigation would be confined to short stages.

Sir James Douglas pointed out that an electric launch was much more easily swung from the davits of a ship than a steam launch, and that it offered greater security at sea. There was no fire to be put out if two or three waves were shipped, and the machinery would work under water. There was also a saving in the number of attendants, one man only being required.

Oil for Wagon Wheels.

A practical man says: "I have a wagon of which, six years ago, the fellies shrank so that the tires became loose. I gave it a good coat of hot oil, and every year since it has had a coat of oil or paint, sometimes both. The tires are tight yet, and they have not been set for eight or nine years. Many farmers think that as soon as wagon fellies begin to shrink they must go at once to a blacksmith shop and get the tire set. Instead of doing that which is often a damage to the wheels, causing them to dish, if they will get some linseed oil and heat it boiling hot and give the fellies all the oil they can take, it will fill them up to their usual size and tighten to keep them from shrinking, and also to keep out the water. If you do not wish to go to the trouble of mixing paint, you can heat the oil and tie a rag to a stick and swab them over as long as they will take oil. A brush is more convenient to use, but a swab will answer if you do not wish to buy a brush. It is quite a saving of time and money to look after the woodwork of farm machinery. Alternate wetting and drying injures and causes the best wood soon to decay and lose its strength unless kept well painted. It pays to keep a little oil on hand to oil fork handles, rakes, neck yokes, whiffletrees, and any of the small tools on the farm that are more or less exposed."

© 1883 SCIENTIFIC AMERICAN, INC

Aluminum.

J. Morris, of Uddington, near Glasgow (German patent No. 22,150, August 30, 1882) claims to obtain *aluminum by treating an intimate mixture af alumina and charcoal with carbon dioxide.* For this purpose a solution of aluminum chloride is mixed with powdered wood, charcoal, and lamp black, then evaporated, until it forms a viscous mass, which is shaped into balls. During the evaporation hydrochloric acid is given off. The residue consists of alumina intimately mixed with charcoal. The balls are dried, then treated with steam in appropriate vessels for the purpose of driving off all the chlorine, care being taken to keep the temperature so high that the steam is not condensed. Now the temperature is raised, so that in the dark the tubes are seen to be at low red, and dry carbon dioxide then passed through. This is said to be reduced by the charcoal to carbon monoxide, which now, as affirmed by Morris, reduces the alumina to aluminium.

Although the quantity of the escaping carbon monoxide is in general a good indication of the progress of the reduction, it is nevertheless advisable not to continue the heating of the tubes or vessels until the evolution of this gas has ceased or even nearly ceased, as, in consequence of slight differences in the consistence of the balls, some of them give up all their carbon sooner than the others. The treatment of the balls with carbon dioxide for the purpose of the reduction lasts about 30 hours, when the substances are mixed in the proportions of 5 parts carbon to 4 parts alumina.

As Morris states, further, the metal appears as a porous, spongy mass. It is freed from the residual alumina and particles of charcoal by fusion and mechanical treatment, and then poured into moulds.—*Dingler's Polytechnisches Journal*, 249, 86; *Amer. Chem. Jour.*

New Test for Oxygen Eliminated by Plants and Animals.

Engelmann has devised the following ingenious test for oxygen, which is described in *Wiedemann's Annalen.* It depends on the fact that the bacteria of putrefaction do not move except where free oxygen is present, and, when the oxygen grows scarce, they collect in those places where there is still some free oxygen, as in air bubbles, etc.

The advantages of the bacterial method employed by Engelmann for investigating plant assimilation consist chiefly in this, that it enables him to detect the smallest trace of oxygen to the trillionth part of a milligramme, and at the same time to determine with microscopic accuracy the places where the oxygen is given off.

He found that only those cells which contain chlorophyl give out oxygen, and that only in the light. The action of light is strictly local; it begins the moment that light strikes it, and seems to cease instantly when darkness comes on.

BUTTER BOX.

The butter box herewith illustrated is of the knock down class, adapted for the economical transportation of food products and other merchandise. The ends of the box are of the same length as the bottom, and the sides have a length equal to that of the bottom and the thickness of the two ends. The parts are hinged so that the ends and sides fold up against the edges of the bottom into vertical positions. The ends and sides are made narrower than the full outside height of the body of the box, so that the staples and screw eyes which hinge the parts together may have a secure fastening

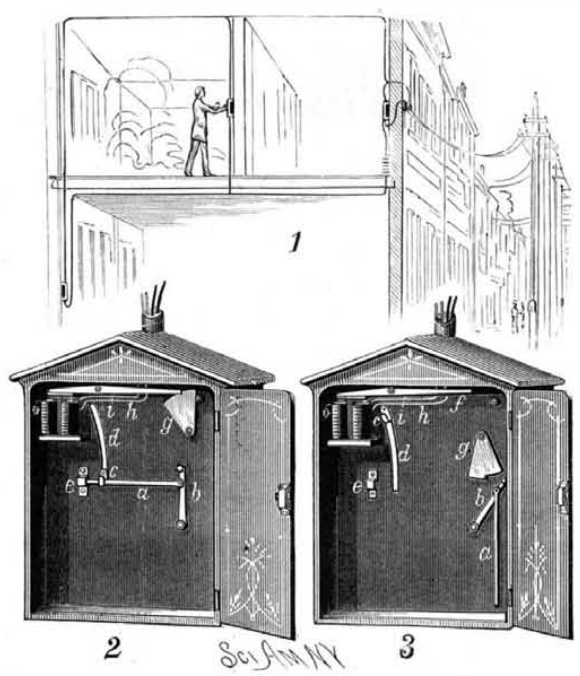
SWEATT'S BUTTER BOX.

in the edges. By this arrangement the boxes may be packed closely upon and against each other. The cover is large enough to fully overlap the upper edges of the sides, a thin strip of metal overlapping the sides and ends, as shown in Fig. 2, thus holding the parts of the box firmly against the butter. In using the box it is set in a suitable square frame whose upper edges are provided with turn buttons, which press against the sides and ends of the box and resist the outward thrust of packing. Before removing from the frame the cover is placed on.

This invention has been patented by Mr. Atherton Sweatt, of Webster, N. H.

ELECTRIC FIRE ALARM.

The method of sending an alarm of fire by means of the ordinary fire alarm telegraph consists in unlocking the door of the alarm box and pulling down the hook against the pressure of an opposing spring, so that when the hook is released it is carried upward and the mechanism connected with it sends the box number to the stations. The alarm box represented in the engravings is of the usual well known construction, and is provided with the hook, *c*, projecting through the slot, *d*, in the front plate, which conceals the mechanism and supports the several parts. Fig. 2 represents the apparatus before the alarm is given, and Fig. 3 the position of the parts after. The hook, *c*, is held down by the bolt, *a*, in readiness to rise at any time when released by the



FINCH'S ELECTRIC FIRE ALARM.

withdrawal of the bolt. One end of the bolt is joined to an arm, *b*, pivoted to the plate, and having its upper end within the path of the pivoted drop weight, *g*. The free end of the bolt passes above the hook, *c*, into a socket secured to the plate. The free end of the drop weight, *g*, is notched to engage a detent lever, *f*, pivoted to the plate, and carrying at one end an armature which is within the influence of an electro magnet placed in the circuit, *i h*, which also includes a battery and push buttons located at convenient points in the building. By preference the push buttons are in locked boxes, the keys being accessible to persons authorized to use them. The passage of an electric current draws the armature of the lever down, relieving the weight, *g*, which swings down, striking the bar, *b*, pulling out the bolt, *a*, thus allowing the hook, *c*, to rise. The alarm may be sent by withdrawing the bolt, *a*, by hand.

This invention has been patented by Mr. R. S. Finch, of 572 W. Seventh Street, Cincinnati, Ohio, and at the Eleventh Industrial Exposition in the above city was awarded first premium medal and a certificate for conspicuous merit.

Wasteful Use of Water.

Mr. Thomas J. Bell, Assistant Superintendent of the Cincinnati (Ohio) Water Works, in the course of a paper written by him upon "The Wastage of Water," gives the following table as representing the daily per capita consumption in five American cities, and claims, with perfect truth, that the great increase of rate is to be charged directly to waste instead of necessity:

Boston, per capita rate in 1850, 30 gallons; in 1881, 92 gallons.

Brooklyn, per capita rate in 1866, 17 gallons; in 1880, 54 gallons.

Chicago, per capita rate in 1867, 43 gallons; in 1880, 114 gallons.

New York, per capita rate in 1867, 62 gallons; in 1876, 100 gallons.

Philadelphia, per capita rate in 1867, 56 gallons; in 1880, 67 gallons.

Cincinnati, per capita rate in 1845, 21 gallons; in 1881, 87 gallons.

New Process Steel.

The *Bulletin du Comité des Forges de France* gives the following statistics of the production of steel by the Thomas-Gilchrist process, during the first six months of the present year:

	Number of furnaces.	Product, tons.
England	1	57,900
France	2	5,960
Belgium	1	12,786
Germany	9	152,479
Austria	3	37,476
Russia	1	12,786
Total	17	279,387

In 1882, 6,500,000 tons of ingots were produced in the whole manufacturing world. As will be seen from the above figures, this process has met with the greatest favor in Austria and Germany; in the former country it prevails in 28 per cent of the steel works, and in the latter in 25 per cent, while it is only adopted in 5 per cent in England.

Another Electric Railway.

On the electric railway lately opened by Lord Spencer, with a large number of eminent scientists, between Portrush and Bushmills, England, the electricity, generated at a waterfall on the river Bush, and conveyed to the end of the line by an underground cable, is carried along through a conducting rail, which is supported on insulators at some distance above the ground. An arm with a brush or pad at the end of it stretches out from the train and keeps contact with this conductor. But on the day when the Lord-Lieutenant came to "inaugurate" the line it was suddenly found that there was a serious hitch. The engine declined to draw the car. The machinery was in perfect order; the connection with the conductor was all right, and yet there was no motion. Horror filled the souls of the public spirited promoters of the first electric line in the United Kingdom. It was discovered, happily before much time had been lost, that somebody had rendered progress impossible by the simple expedient of driving a piece of iron from the electric rail into the bank at the side, so that the current was being absorbed into the earth as fast as it was transmitted from the Bush. The iron being removed, the invited party made a successful trip.

Uninflammable Paper and Wood.

Dr. Winkelmann, of Augsburg, impregnates wood and articles made of paper with a solution of 33 parts of chloride of manganese, 20 parts of orthophosphoric acid, 12 parts of magnesium carbonate, 10 parts of boracic acid, and 25 parts of chloride of ammonium in 1,000 parts of water.

Wood must be exposed to the solution for six or eight hours at the temperature of boiling water, or have the solution forced into it under pneumatic pressure. A solution of the above composition is easily distributed through the mass of the wood, and incrusts the cells with pyrophosphate of manganese and magnesium, and borate of magnesium, which are insoluble double salts. The chloride of ammonium serves as vehicle to keep the phosphates in solution.

Articles made of paper, like paper hangings, are coated with or soaked in the solution after it has been boiled.

Wood and paper saturated with these salts are uninflammable even when exposed to an intense heat.—*Chem. Zeit.*

CHURN.

The churn which the accompanying engraving illustrates has been patented by Mr. Henry Hays, of Bridgeport, California. The cream box is cylindrical, and has its inner surface serrated or grooved longitudinally as shown in the sectional drawing, and at one end is provided with a projecting pintle fitting in an aperture in a standard secured to a base. The other end of the cylinder is furnished with an aperture that can be closed by a flanged cover. The pintle at this end is threaded, and passing through the cover is secured to a cross piece resting against the inner surface of the head from which two clips project in opposite directions, and under the clips the cross piece passes as shown in the small engraving. The cover is pressed against the outer surface by the winged nut of the pintle, a packing strip having been inserted between the head and cover. The threaded end of the pintle is adapted to be screwed into the end of a shaft which is journaled in a standard, and is provided with a pulley when

HAYS' IMPROVED CHURN.

power is to be applied, and with a crank for hand work. A supporting frame, having its upper edges recessed so that the cream box fits against them, rests upon the base. After the pintle has been screwed into position, a latch arm on the standard drops into an annular groove on the shaft, thus preventing further longitudinal movement. When the cream box has been filled, the supporting frame is moved one side, when it is lowered and freed from the box, as it is provided on its bottom with beveled tenons sliding in longitudinal grooves in the top of the base.

A washing machine can be constructed according to the same principle.

© 1883 SCIENTIFIC AMERICAN, INC

THE ELECTRO DYNAMIC MOTOR.

With the manifold adaptations of light machinery has come the demand for a motor specially adapted for such work. The characteristics which this should possess in order to comply strictly with the requirements were peculiar, and were to a certain extent governed by the conditions surrounding its field of operations. Durability of the working parts and simplicity in construction were essential, but it should, prerequisitely, be absolutely safe, perfectly reliable, and automatic, since any technical knowledge of its principles could not be expected from the majority of those who would use it. The first cost and the running expenses should, of course, be small.

For a long time electricity has been considered the most likely source from whence to obtain this power, and the Electro Dynamic Company, 121 South Third Street, Philadelphia, Pa., manufacturer of the "double induction" motor, patented by Mr. W. W. Griscom, claims for its apparatus all of the above points, and these claims are strongly substantiated by the success attending the motor.

The motor consists of two semicircular electro magnets, which together form a ring; their poles project inward, and with the wire coils form a cylindrical tube, within which a Siemens armature revolves. These coils are wound in opposite directions on each section, so that both coils unite in producing a north pole in one of the open spaces and a south pole in the other. The iron of the poles extends laterally beyond the ring, forming supports for the plates which carry the bearings of the armature shaft and the brushes of the commutator.

The disposition of the parts will be readily understood from Fig. 1, which is a perspective view of the motor. In order to reduce the effect of the wear of the journals to a minimum, the bearings of the armature are steel and the rear bearing of the surgical motor is provided with an adjusting screw with which any wear may be taken up. As the direction of the wear is away from the point of nearest approach, the poles of the armature and magnets can never come in contact from this cause, and a source of annoyance and danger frequent in former motors is thus obviated. The brushes are in pairs, and the shape of the commutator is such that one brush will always touch one-half of the commutator before its companion leaves the other.

The armature and the field magnet are connected in series, and the current enters the armature by the upper commutator brush, leaves it by the lower, and from thence passes to the field magnet and to the second binding post.

All the parts of the machine are interchangeable, thus facilitating repairs in case of accident. Each machine is thoroughly tested before leaving the manufactory.

The patent automatic battery, manufactured by the same company and specially adapted to run the motor, is of the bichromate of potash variety, and is inclosed in a neat case. It consists of six one-gallon cells, in each of which are two carbons and one zinc, and a mechanical device for removing all the plates from the liquid as soon as the pressure on the lever is removed. The degree of immersion, controlled by the lever, thus permits the perfect regulation of the amount of current supplied to the motor. The lower part of the zinc plate will be dissolved more rapidly than the upper part, and it is, consequently, sometimes made wedge-shaped, the butt being down. The battery fluid is made, according to Mr. Griscom's method, by putting three-fourths of a pound of bichromate of potash in a colander near the the top of a gallon jar, covering the crystals with cold water, and then putting two pounds of sulphuric acid upon them, which rapidly causes them to dissolve with the evolution of a little heat. With such a battery the motor can be run at any speed up to 10,000 revolutions per minute.

In Fig. 2 the motor is represented attached to sewing machines. The battery is of such size that it forms a convenient seat for the operator, and the lever guiding the movements of the plates is operated by the treadle. The speed of the machine can be regulated to a nicety from 20 or 25 stitches a minute to as high as 900. A special advantage is that when the foot pressure is removed the plates are automatically raised clear of the liquid and all expenditure instantly ceases. The same motor, supplied with a minute fraction of the current of an electric light system, will drive a sewing machine at 3,000 revolutions per minute at an almost inappreciable expenditure.

Fig. 3 represents a fan, driven by the motor, for use in apartments when a breeze is only occasionally required. The V motor, shown in Fig. 4, is designed especially for use in connection with the fan. In general principle it does not differ from the one already described, but is furnished with a reversing attachment, by which the motion can be reversed while running at full speed. The disposition of the parts will be readily understood from the cut, in which AA represent the magnets, B the armature, C the commutator, E the commutator disk, H H the brushes, I I binding posts, and O the reversing attachment.

The Edco fan battery, Fig. 5, is intended for constant use. It is 16 by 13½ by 9½ inches and consists of two cells, each having one zinc 6 by 10 inches. This battery, charged with the fluid already described, will drive a rotary fan of 7½ to 8 inches in diameter for nearly seventy hours. The large Edco battery, Fig. 6, is composed of a number of portable cells, size 13 by 20 by 7¼ inches, each one holding elements 12 by 12 inches, the trough being lined with lead, furnished with a lifting device.

Six of the small size Edco cells have sewed 4,046 yards of three thicknesses of shirt muslin on a Singer sewing machine in twelve days, at the following expenditure:

9¾ pounds of bichromate of potash	$1.95
31½ pounds of sulphuric acid	.65
4 pounds of zincs, at 7½ cents	.30
Mercury (estimated)	.10
Total	$3.00

or more than 14 yards sewed for one cent. This is the best authentic result ever obtained by battery power on a shuttle machine; and while too expensive to compete with steam, it is far cheaper than foot power, and sure to find favor with the seamstresses and dressmakers who suffer from using the treadles.

Fig. 7 is a device by Mr. Griscom for applying the motor to a boat, which, as will be readily seen, can be propelled, steered, and backed, without rudder and without reversing engine.

The motor has proved of great benefit to surgeons and especially to dentists for driving various instruments. The old style dental engines were all operated by a treadle, and they compelled the operator to remain for a long time in fatiguing positions, and to keep their foot in motion in a way which interfered with delicate manipulation. The S. S. White Dental Manufacturing Company, of Philadelphia, having obtained the exclusive agency for the United States of the motor and battery as applied to dental and surgical engines, is using this device extensively as a source of power.

The engraving, Fig. 8, represents the motor in connection with a dentist's chair. When so situated the immersion of the plates of the battery is controlled by a knob, L, projecting from the floor in a location convenient to the dentist's foot, the battery being in another apartment. The motor can be readily applied to the improved dental engine manufactured by this company. The shaft of the armature of the motor is hollow to receive the rigid end of the cable, and has a carrier pin, over which the groove in the cable passes. The end of the bearing has a thread upon which the rigid section of the sleeve is screwed. This combination prevents any vibration extending to the hand piece. The motor is shown suspended from a spring balance attached to a traveler on a crane, giving to the flexible arm a range greater than that imparted by the rocking standard of the engine. The above are only a few applications of the motor. It is serviceable wherever a small power is required. Although weighing but about 2½ lb., it gives a power of about one-sixth H. P. It affords a motion which can be stopped, reduced, or accelerated instantaneously. It incurs expense only when working.

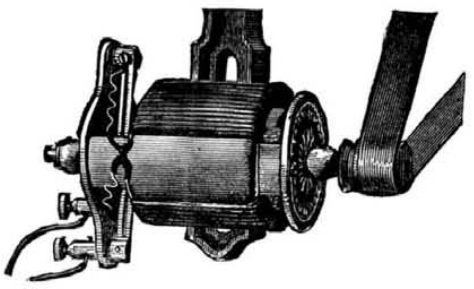


Fig. 1.—THE ELECTRIC MOTOR.

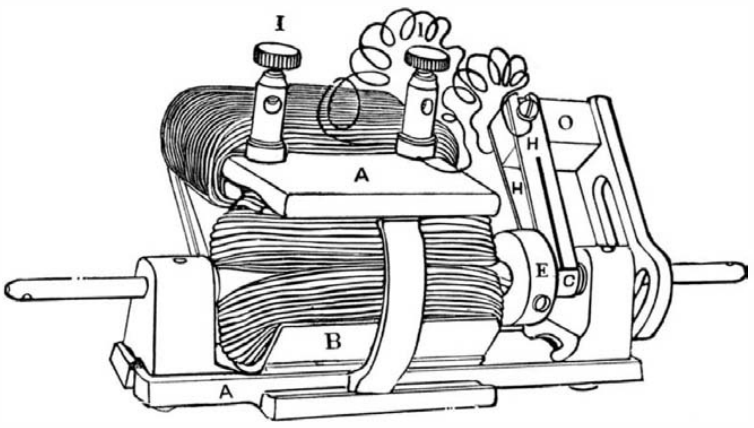


Fig. 4.—THE FAN MOTOR.

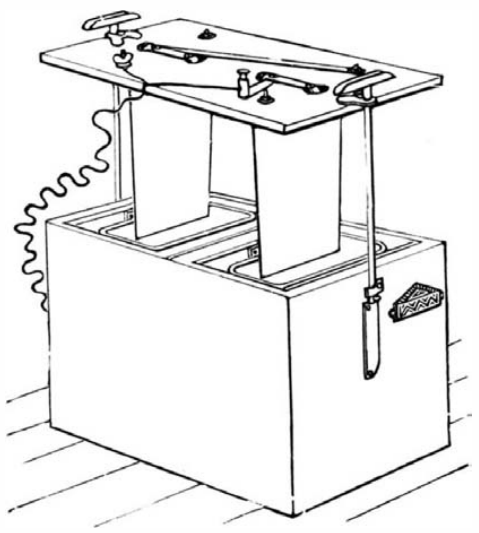


Fig. 5.—THE EDCO FAN BATTERY.

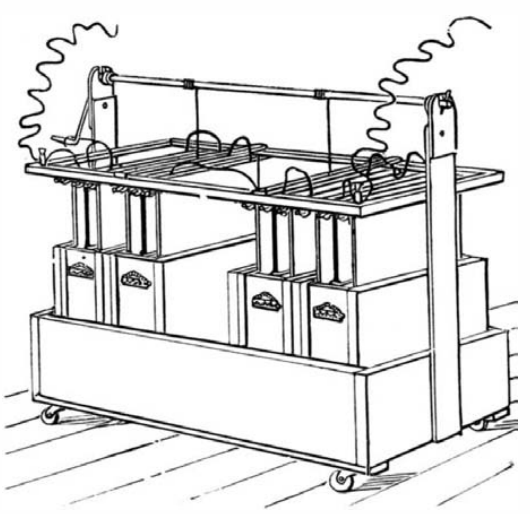


Fig. 6.—THE LARGE EDCO BATTERY.

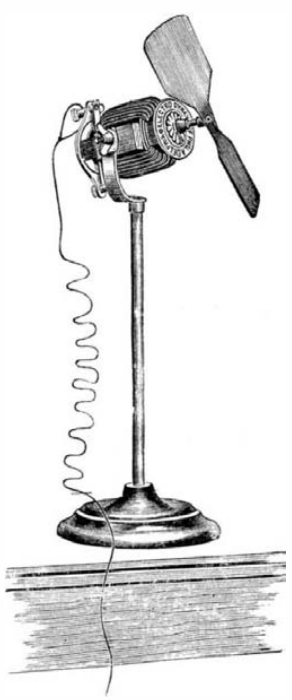


Fig. 3.—THE ELECTRIC FAN.

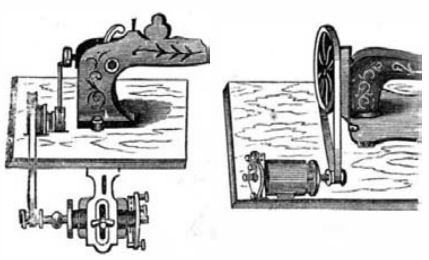


Fig. 2.—SEWING MACHINE MOTOR.

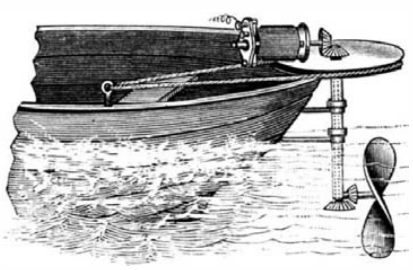


Fig. 7.—THE ELECTRIC BOAT MOTOR.

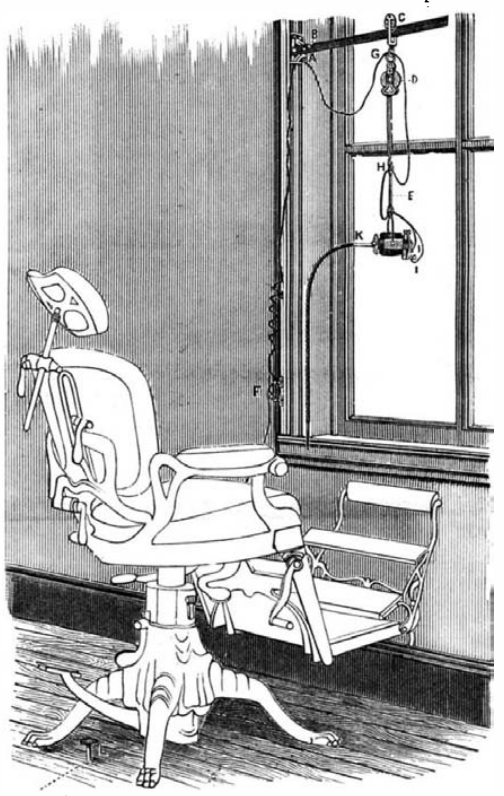


Fig 8.—THE ELECTRIC DENTAL MOTOR.

© 1883 SCIENTIFIC AMERICAN, INC

Iodide of Nitrogen.

It is well known to chemists that by merely pouring ammonia upon iodine crystals a very violent explosive is produced that explodes with a touch, a breath of air, and even of itself. It has received the name of "iodide of nitrogen," although the difficuty of purifying and analyzing it renders it both dangerous and difficult to decide this point. Bunsen, who has experimented with it, believes that it contains hydrogen, and assigns it to the formula NI_3NH_3.

Antony Guyard has recently been studying the effect of light upon iodide of nitrogen. He says (*Comptes Rendus*) that iodide of nitrogen suspended in water, or better, in aqueous ammonia, is affected by the undulations of light, heat, and sound, as well as contact with any other substance.

Under influence of light iodide of nitrogen is rapidly decomposed, nitrogen gas escapes, and at the same time iodide and iodate of ammonia are formed. In water the decomposition goes on quietly at first and ends in an explosion; in ammonia solution, on the contrary, it goes on quietly to the end until all the iodine is gone. Iodide of nitrogen is sensitive to diffused as well as direct sunlight. The decomposition takes place at ordinary temperature, and also in a rapid stream of water at 34° to 41°. The heat spectrum has no effect, only the light spectrum has a violent action; the maximum effect is produced in the yellow, and the minimum in the violet.

If iodide of nitrogen has the composition of NH_2I, it is decomposed completely in water by the action of light without explosion, according to this formula:

$$2NH_2I = NH_4I_2 + N.$$

This agrees perfectly with the actual phenomena. But iodide of nitrogen does not always have this composition, but incloses more or less of other substances, so that the decomposition only follows this equation in part; the explosion follows as soon as all the NH_3I is destroyed. Its decomposition with the formation of iodide of ammonia is easily expressed with any formula for iodide of nitrogen. With the so-called typical formula NHI_2 we have the following:

$$5NHI_2 + 12NH_3 = 10NH_4I + 7N,$$

which agrees with the experiments. With water it forms biniodide of ammonia; with ammonia it forms the protoiodide.

Guyard tried to utilize the photo-chemical sensitiveness of iodide of nitrogen in ammonia solution for photometry or for estimating the chemical and mechanical equivalent of light. For this purpose he made use of an instrument resembling a Gay-Lussac burette. The wider tube can be closed with a ground glass stopper. He introduces 1·27 grammes of iodine, then fills it up with ammonia, and inserts the glass stopper, and places the instrument in the light. The nitrogen collects in the upper part of the burette, and its volume can be read in cubic centimeters and tenths. From 1·27 grammes of iodine 33·5 c. c. of nitrogen will be evolved; the reaction is the same whether iodine or iodide of nitrogen is employed. The following equation expresses the reaction:

$$13NH_3 + 10\,I = 10NH_4I + 3N.$$

All iodide of nitrogen compounds are decomposed by sulphuric, hydrochloric, or sulphurous acid, even very dilute, with violent explosion, and they dissolve without decomposition in hyposulphite of sodium.

Paper Pulp from Cedar Bark.

A new use of cedar bark has been undertaken at New Bedford, Mass. According to the *Northwestern Lumberman*, the Acushnet Paper Mill, at that point, is nearing completion, and was built for the express purpose of manufacturing pulp and paper of cedar bark. It is the first enterprise of the kind ever undertaken, though the process has been satisfactorily tested on a small scale. An agent of the company is now in Maine purchasing a supply of bark. There is a large quantity at Bangor, Calais, and St. John, N. B., where large quantities of cedar shingles are sawed. The bark is taken from shingle butts, that are 16 inches long, and are bundled for shipment like lath. The Acushnet Mill will work up three cords of bark a day. The first product will be used for carpet linings, but the paper is said to be equally adapted to other important uses. For carpet linings it will be unequaled, on account of its quality of keeping off insects. Eastern ingenuity is bound to devise an endless variety for the utilization of woods, this invention for making paper of cedar bark being the latest evidence of it.

To Attain Long Life.

Some one wisely says that he who strives after a long and pleasant term of life must seek to attain continual equanimity, and carefully to avoid everything which too violently taxes his feelings. Nothing more quickly consumes the vigor of life than the violence of the emotions of the mind. We know that anxiety and care can destroy the healthiest body; we know that fright and fear, yes, excess of joy, becomes deadly. They who are naturally cool and of a quiet turn of mind, upon whom nothing can make too powerful an impression, who are not wont to be excited either by great sorrow or great joy, have the best chance of living long and happy after their manner. Preserve, therefore, under all circumstances, a composure of mind which no happiness, no misfortune, can too much disturb. Love nothing too violently; hate nothing too passionately; fear nothing too strongly.

THE RE-ENFORCEMENT OF DEFICIENT WATER SUPPLY IN WELLS.

BY G. D. HISCOX.

The water supply in many parts of the country is beginning to assume an aspect that is causing much apprehension, especially in dry seasons, when it becomes a common complaint that wells not only run low, but actually dry up. At such times towns and cities are put upon short allowance as the only means of weathering a drought.

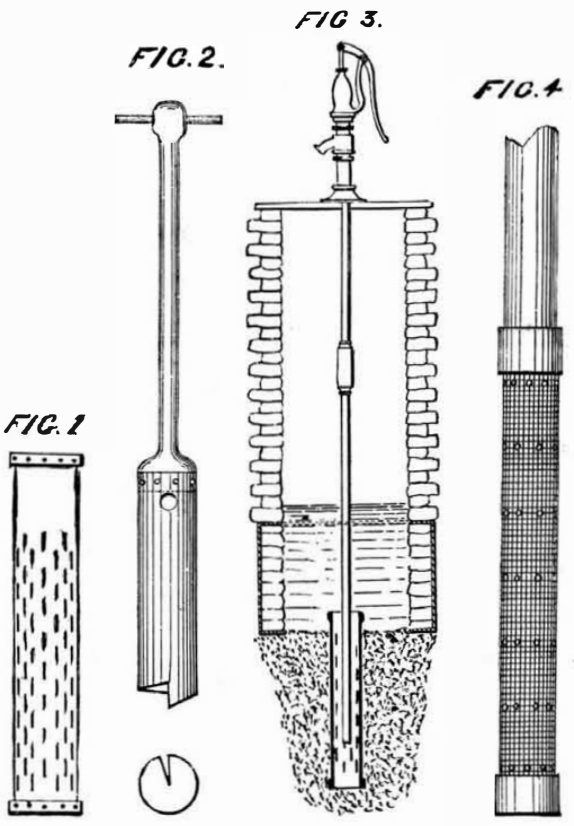
It therefore becomes a matter of importance, to those having little or no resource beyond the supply of their wells, to have at hand such information as may be applicable to the various conditions of water supply, as will enable them to know what can be done to increase the flow of water in their wells in the most economical manner.

After a well curb has been settled into place and the earth settled solidly around, it is a matter of no little difficulty to deepen the well by the old methods of digging out and sinking an inside curb, for in most cases it is premised that well curbs are at first sunk as far as practicable.

In wells having a substratum of gravel, sand, or quicksand, much can be done toward obtaining a deeper supply by materials and appliances that can be furnished by any tin or sheet iron worker or even a blacksmith.

For this purpose let a tube be made of galvanized sheet iron of Nos. 18 to 20 wire gauge (about $\frac{1}{32}$" in thickness) of from 4 inches to 6 inches in diameter, with riveted or lock seam, as convenient; open ends, with a band riveted upon each of the ends to stiffen them. Put the tube upon an iron mandrel or bar, in such a manner as to allow of cutting with a sharp cold chisel a series of slots, as represented in the cut, Fig. 1.

These slots must be cut as evenly as possible by driving the chisel just through, leaving the cuts no wider than will admit a piece of thin tin to pass. If a slot should be inadvertently cut too wide, it can be partially closed by moving it to the end of the mandrel and pressing the edges together.



The next appliance is an auger to bore out the sand from the inside of the pipe. This may be made of galvanized sheet iron, the same that the strainer tube is made of, and from one to two inches smaller and about two feet long. The boring end should have a spiral lip which can be made of a disk of galvanized sheet iron, slotted and hammered into the proper shape, and then soldered into the end of the auger tube; make a hole at the upper end to facilitate the discharge of the sand from the auger.

A wooden or iron handle will complete it, as illustrated in Fig. 2, making the auger three or four feet longer than the strainer tube for convenience of handling. The operation of sinking and boring out the strainer tube can be most conveniently done by the use of two ladders standing upon the bottom of the well, with a board across the rungs near the water, which will enable a person to operate the auger with facility and safety.

The strainer tube is to be placed in position near the center of the well, and gently crowded down into the sand by the weight of the person, and by vibrating the tube a little, so as to get it down as far as possible before commencing with the auger. Then with the auger in hand bore a charge from the inside of the strainer and pass the auger out of the well to be emptied. As you bore upon the inside below the bottom of the strainer, continue to push down the strainer, and at last strike it lightly with a wooden ram or block, which can be done by the hand, moving the ram in vertical line, so as to keep the strainer also vertical.

In this manner the strainer may be sunk until its top is nearly even with the bottom of the well, and the sand bored out flush with the bottom of the strainer.

The pump pipe or suction may be placed within the strainer and terminating near the bottom, as this will enable the full depth of the well and the re-enforce to be utilized.

A re-enforce of this kind, as illustrated in Fig. 3, will relieve most wells in sandy soil of their short supply.

Where it is found desirable to sink a strainer for a deeper and larger supply, a stronger pipe is recommended, such as a boiler tube drilled with $\frac{3}{8}$ inch holes in rows about $1\frac{1}{4}$ inches apart for a distance of 3 to 4 feet from the bottom; after which it may be galvanized and covered with two layers of brass wire cloth or gauze No. 40 upon the inside or next to the pipe, and No. 50 upon the outside.

The gauze must be soldered at the laps and also to the pipe in spots between the holes, and well soldered to the pipe at the ends or top and bottom, to keep the gauze from being displaced by the process of sinking.

With this material a re-enforce of from 10 to 20 feet in depth may be made which will meet the requirements from nearly all ordinary wells. In large wells the strainer pipes may be *duplicated* to the full extent of the water resource for the area of the well. Where as small pipes as 2" bore are used, as many as five have been sunk close to the curb in a well 6 feet in diameter, and seven or eight in a nine foot well with the most satisfactory results.

Where there is uncertainty as to the character of the lower stratum, or below the bottom of the well, or a clay stratum that may require to be passed through, it is better to make the re-enforce of a more substantial material, say of the ordinary galvanized iron pipe with screw joints; using a little more precaution in fastening the wire gauze strongly to the perforated pipe, which may be no longer than is required for the strainer, for convenience of handling in making, with a coupling firmly screwed upon both ends.

This being ready to attach to a pipe of the desired length, the wire gauze may be fitted closely between the couplings and soldered, as described above.

For large pipes, say of from 6 to 10 inches in diameter, machine screws may be used to fasten the gauze to the pipe, and a spot around each screw head soldered to it; also a row around the bottom to keep the gauze from slipping, as illustrated in Fig. 4.

For re-enforcements to be made without boring out the sand through the inside of the pipe, the strong wrought iron pipe with screw joints should be used in every case, and in addition to the pipe as represented in Fig. 4, a point or chisel end should be screwed into the lower coupling; this can be made by drawing a short piece of pipe to a point, or flatten the end, weld, and sharpen. The upper end requires a heavy iron cap for receiving the blows of a hard wood ram, which may be a stick of timber handled by hand or slung to a rope over a pulley.

Where there is an opportunity of using a lever to press the pipe down, it makes the work much easier. The fulcrum may be a piece of timber thrown across the well and loaded with stone.

This process of sinking well pipes is much used, and a variety of plans of application may be suggested by the situation of the well and the means at hand, a pole being often used to transmit the lever power from the top to the bottom of a well.

Some of the salt wells near Syracuse have pipes driven 200 feet by levers with weighted fulcrums.

There are many wells in New York and vicinity that have been re-enforced in the manner above described, with a large addition to their old supply, and here and there a dry well is brought to new life. The great well of the Long Beach Improvement Company, at East Rockaway, which is 22 feet deep and 40 feet in diameter, is a notable instance of the enlargement of flow of water into a well without for a moment disturbing or interfering with the constant and necessary supply for the use of the great hotel at Long Beach, at a time when a day's suspension of the water supply would have been disastrous.

In this well two strainers of 6 inches in diameter have been sunk to the depth of 30 feet below the bottom of the well, or over 50 feet below the surface of the ground, and touching the bed rock; having passed through a stratum of clay at a depth of 8 feet below the bottom of the well and entering a substratum of sand which is supposed to be fed by the rain fall upon the central part of the island; judging from the fact that the clay stratum crops out at Pearsall's and along the line of the water works conduit.

Upon trial the pressure from the new source of supply sustained a hydrostatic pressure of 4 feet above the level of the water in the well.

The tops of the re-enforcing pipes terminate about two feet above the bottom of the well, and indicate a strong flow of water when the surface is pumped down to within a few inches of their open ends. The present supply capacity of the well is over 130,000 gallons per day.

The great well in Prospect Park, Brooklyn, was re-enforced with pipes driven horizontally beyond the walls near the bottom. This was evidently a mistake, as the practical working of this well shows; for as the surface of the water is pumped down and below the open ends of the pipes, the flow gradually lessens and finally ceases altogether at a time that it is most required, and at which a re-enforce, tapping a lower stratum, would yield the largest supply.

THE draught at the Mexican mine at Virginia City, Nev., through the upraise from the 2,900 foot level, is so strong as to constitute a stort of subterranean tornado. It has been found impossible to keep lights burning in some parts.

© 1883 SCIENTIFIC AMERICAN, INC

Correspondence.

Fast Railway Time.

To the Editor of the Scientific American:

You speak of the Canada-Atlantic Railway—Coteau to Ottawa, 78 miles, at 50 miles per hour—running probably the fastest train in America. I inclose you a time-table of a train on the Pennsylvania Railroad, leaving Jersey City daily at 4:08 P.M., and arriving at Trenton 5:10, making the run of 56 miles in 62 minutes, or 54 miles an hour.

S. CASTNER.

203 Walnut Street, Philadelphia.

Storage of Wind Power.

To the Editor of the Scientific American:

I have been much interested of late in the question of the storage of wind power, and have studied the feasibility of the several methods proposed, but it seems to me that they lack practical utility for the masses of the people.

I would suggest that wind power be utilized in compressing air into a small cylinder capable of withstanding great pressure, and that the power stored in the cylinder should be used for the purpose of locomotion, as to propel a light vehicle to accommodate one or two persons. It seems to me that the first cost of this apparatus ought not to exceed much the cost of a team; and if two cylinders were employed, one could be used to propel the vehicle while the other was being filled at home.

By this means horse power could be dispensed with for this purpose, and the masses of people could be supplied with a first class means of locomotion, whereas now comparatively few *good* horses are to be found.

F. A. R.

Brewster, Mass., Oct. 29, 1883.

Lucilia Macellaria.

To the Editor of the Scientific American:

In the number of your journal for October 13 (SUPPLEMENT 406, page 6486), in which a copy of my letter and one of Professor C. V. Riley, to the National Museum, were printed, in which are several inaccuracies, which are very important to be corrected; and as the letter of mine of October 6, 1882, which I sent with the fly to the Smithsonian Institution by express, appeared one year after I sent it in the National Museum, and as the correction I sent to the Professor, after I had seen it in print in your journal, probably would not be made public before a year had passed, I send this line, which you will be so kind as to publish in your paper.

The Professor let me say: "The head of the fly is black," when I said "that the heads are of a bronze color, with a yellow stripe in the middle." Scientifically I had better said that the eyes are of a bronze and the face of a yellow (orange) color. The ones I sent to the Smithsonian Institution by express must have died before they reached the Professor, as the ones I have, some of their eyes are now black, some are brown, and the faces are of a dead, dirty yellow color. Therefore the name *Lucilia macellaria*, Fabricus, cannot be the proper one.

2. "The pain was described by the patient as dropping, tearing, boring."

3. I did not say the flies laid their eggs in the ear of the horse, but said, "The flies laid their eggs in the slushs (slough, prepuce of man) of horses." A teamster told me that he rubbed pennyroyal oil in the slushes of his horses when they passed through the timber bottom, between Alton and St. Louis. The flies only laid their eggs in the moist secretion from the mucous skin, never in an oily wax secretion, as the ears secrete, as this will kill the eggs.

4. I said: "When I dropped the maggots on the soil, they screwed themselves in it," whence we have the popular name screw-worms.

5. "A case was reported from La Cygne, Kansas," not Georgia.

FRED HUMBERT, M.D., F.C.S.

Alton, Ill., October 24, 1883.

The Tehuantepec Ship Railway.

As the result of an interview with Chief Engineer E. L. Corthell, we give the following as the latest official information concerning the plans and prospects of the Tehuantepec Ship Railway.

Martin Van Brocklin, the company's resident engineer, has lately returned from the Isthmus, and with a dozen assistants is busily engaged in working up the notes of his survey, which was commenced on the 20th of last March and completed on August 17. This survey is remarkable in being the first complete connected instrumental survey ever made across the Isthmus. All preceding schemes have been based upon a patchwork of partial surveys and general reconnoissance. Mr. Corthell remarked that the results of this work are very gratifying. To use his own words: "We are happily disappointed in these surveys; they are betterthan our most sanguine anticipations." A personal examination of the profile shows a line, for the greatest part of the way, that would be classified as "light work" even in a prairie country; the heavy work is all practically concentrated toward the Pacific end, and the deepest cutting, which is about 175 feet, is short in length, and admirably adapted by its position for furnishing the rocky material required for the construction of a sheltering mole or breakwater in the harbor.

The total length of the line from Minatitlan on the Gulf side to Salina Cruz on the Pacific is 153 miles. For 60 miles out of Minatitlan the country traversed is an alluvial plain, with abundant timber and a fertile soil; the next 20 miles is a gradual ascent up a wide valley to the foot of the main divide; within the next 33 miles comes all the heavy grading, but no exceptionally difficult work is encountered. The remaining 40 miles to Salina Cruz are over a level plain.

The maximum grade will not exceed one per cent, and this grade is limited to a distance of four miles on the Atlantic side and eight miles on the Pacific side of the divide. The alignment is remarkably good, considering the purpose of the road and the country passed through, and Engineer Van Brocklin and the company are both to be congratulated.

Some radical changes have been made in the system proposed for transferring the ships from the water to their position upon the railway, and in the transporting cradle itself. The cross section of the cradle now shows a strongly built iron girder, supported by spiral springs, upon four sets of wheels running on four rails; the wheels are about 26 inches in diameter, and spaced 3 feet apart longitudinally. One of the original stumbling blocks was the difficulty of adjusting the cradle to the various outlines of the hulls to be transported. This is now provided for by the addition of two small auxiliary girders, one on each side of the hull, each lying in the line of the main girder and hinged to it at the inner end; the outer ends of these auxiliary girders carry pivoted bearing blocks, and by the medium of an elevating screw passing into the main girder these blocks can be accurately fitted to the hull by raising the outer ends of the small girders.

For placing the ships upon the railway, a vertical hydraulic lift is to be used with an accumulator of enormous power, the designs for which are now being worked up in the company's office. The ship will be run directly over the cradle, and cradle and ship lifted bodily to the level of the railway. This plan is to replace the incline originally contemplated.

Complete estimates of cost, and both general and detail plans, are now being prepared as rapidly as possible; these are all to be finished by October 23, when Captain Eads, together with Colonel James Andrews, Honorable A. G. Cochrane, and Resident Engineer Van Brocklin will sail for Liverpool. Leading English capitalists have been anxiously awaiting the presentation of accurate surveys and estimates; and as the party take these with them, it is expected that a company will be formed immediately upon their arrival in England for building the ship railway.

In connection with this subject we might mention that the use of Captain Eads' name has been solicited by certain English capitalists and engineers in a project for building a ship railway across the Isthmus of Suez. It is said that such a railway could be completed in two years for the sum of $25,000,000.—*Engineering News.*

The Wheelman's Horse.

Although the day will never come when the horse, the noblest animal next to man, will be dispensed with as man's comrade in out door pleasures, it is curious to see how already new inventions are taking the place of the equine servant for both pleasure and use. Electric motors and cable grips and dummy engines are preparing to drag all the horse cars; traction engines, road engines, steam plows, mowers, and steam thrashers are harvesting, planting, breaking down macadamized roads, hauling, leveling, mowing, by iron steeds that require no food except while in the act of work. Even at short distances and for menial service the day is perhaps not far off when ash carts and garbage carts may have their bottled electricity under the box, that will propel them in their rounds. For pleasure journeys it was once believed the horse would always stand first; what could be found to approach that union of mind and matter, that intelligent propulsion by keenly responsive muscle and nerve, that is found on the back of a high mettled horse?

The bicycler and tricycler, or, as it is now the fashion to say, the wheelmen, claim to have come very near this joy of motion. When the steely cobweb of his wheel spins under him, obedient to the slightest hint of his calf-heel muscle, the cycler can for a season cover long distances without fatigue, and in a degree only second to horseback riding may enjoy exercise without exertion. The weight of his trunk is latent from the lower limbs, and there is no concussion of the foot on the ground as in walking; both these are savings of vital force. In reasonable cycling there is said to be no strain upon the organs of respiration; in racing or any severe trial of speed, the objection to cycling is that the lungs are contracted and the chest bent forward.

The wheel has put down all the early incredulity, even the calculation by a man of science that it was positively impossible for any person to propel himself on the best road at a greater pace and for a longer period than was possible by the simple act of walking. While it is indisputable that the walking develops and brings into play (especially if the pedestrian has learned to walk with his arms as well as his legs) far more activity and variety of muscle than the "wheel," it is also fully proved that a longer distance and greater refreshment by the open air can be attained by the bicycler and tricycler with no sense of fatigue at all, if he knows how and how far to ride.

Dr. B. W. Richardson, who sets down cycling as indisputably the best exercise for intellectual workers, says: "If I walk ten miles in three hours, at a fair pace, I am tired; my ankles feel weak, my feet sore, my muscles weary, so that after the effort I am unfitted for any mental work until recruited by a long rest. If I go the same distance on the tricycle, on the same kind of road, I find that an hour and a half is the fullest time required for the distance, and instead of being ankle wearied and foot sore, with a sense of fatigue, I am agreeably refreshed by the exercise, *and ready for study and other mental* occupation." Dr. Richardson takes the occasion, however, in a paper which is the leading attraction in *Longman's Magazine* for October, "Cycling as an Intellectual Pursuit," to mark the extreme where a pleasure excursion begins to be a pleasure exertion, and a damaging exertion too.

With a machine reduced in weight to twenty-six pounds, and propelled on a good track nearly twenty miles an hour, the temptation to overdo matters is extreme. "Young and old, male and female, weak and strong, areall going wrong on this mania about records." A middle aged man starts a tricycle; he can do eight to ten miles without fatigue, throws off his gout, works well, sleeps well. Then he begins to beat his record; gets over his thirty to forty miles in a day, perspires freely, and the next day comes a smart touch of his old enemy, his nerves are broken down, and he will be shaky and uncertain in his resolutions and movements for some time to come. Younger riders are also overdoing it.

"To make one hundred miles a day on ordinary roads on a bicycle is now considered commonplace among practiced riders; on a tricycle—which was held the slower vehicle—one rider, Mr. Marrott, has gone two hundred and nineteen miles, and an English lady, Miss Allen, has accomplished one hundred and fifty-three miles within twenty-four hours. Cycling necessitates temperate habits; hard drinking cyclists will go to the hospital and to their graves as fast as their machines can carry them." What Dr. Richardson calls the ventilation of the body, by hours of free inhalation of the open air, is certainly made easier for most folks by these cheaper steel rivals of the horse.

Under the limitations he suggests, and cautions against over training and over taxing, which all lead to vascular and nervous disturbances, to hypertrophy of muscles, and to undue absorption and anxiety in the sport itself, with these dangers provided for by the temperate use of the wheel, he can afford, as can all cyclists, to calculate the knowledge, as well as pleasure and health, that will come to men and women by these latest inventions in steel steeds.

The fable of the centaurs calls for new designs. In their moments of common activity and accord the horse and his rider have been enthusiastically called the two most intelligent and finished creations that God has made. Let the man on the horse "give to the torso originality and will, give to the rest of the body the combined attributes of promptness and vigor, and you have a being of sovereign force, thinking and acting, courageous and rapid, free and controlled." Now, much of this poetry can be cast in a foundry; modern invention has now put into the "cycles," bi, tri, or by whatever name they may be called, the same combinations with the rider's will. No prejudice against the horse, however; for through all "cycles" he is likely to remain the favorite companion on the road.—*Philadelphia Ledger.*

Use of Standard Gauges.

A writer in the *Industrial World* says that "to provide a set of standard gauges for use in machine shop work, whether of the ring or the plug form, or of the inside and outside caliper type, is an exceedingly good thing, but the task still remains of leading up to and compelling their intelligent and skillful use. This is sometimes a far more trying thing than to find the money needed for their purchase, for that usually depends upon one man or two only, while the use of the standards must be taught to all concerned, both good and bad together, so far as their readiness to apprehend such things is concerned."

One great trouble of the general introduction of close gauges in the machine shop is the adherence to the old-fashioned trust to sight, and the trial of the spread of the calipers on a flat rule. There can be no exactness in measurement for fits when the eye and the straight rule is the guide. There is only one sense of exact measurement of dimensions in the exact fitting required in the machine shop, and that is the measurement—or the test—by feeling. This testing ought to be a portion of the drill of the machinist's apprentice—possibly of the machinist himself, who has passed the novitiate and is a journeyman. Nothing could be better for such practice than a handling of standard gauge plugs, and a passing of them between the jaws of fixed caliper gauges

A Recording Telephone.

Mr. St. George, the inventor of a telephonic system recently brought out, has devised a means of recording a telephonic conversation by the aid of photography. A circular plate of glass is coated with collodion, and made sensitive as a photographic plate. This is placed in a dark chamber having a small slit, through which a pencil of light can fall upon the sensitive surface of the glass. The vibrating telephone plate actuates a shutter which varies the thickness of the luminous pencil correspondingly to the vibrations after a plan introduced by Professor Graham Bell, if we mistake not. The pencil falling on the photographic plate prints a dark line on it whose thickness is proportional to the vibrations of the telephone plate. The plate is revolved by clockwork like the barrel of a phonograph, and the record is afterward chemically fixed.

© 1883 SCIENTIFIC AMERICAN, INC

Emulsions of Petroleum and their Value as Insecticides.

BY C. V. RILEY, OF WASHINGTON, D. C.

The value of petroleum for the destruction of insects has long been recognized, and I have for years been endeavoring to solve the question of its safe and ready use for this purpose without injury to plants. The paper contains the results of extended experiments carried on under my direction by several of my assistants, and particularly by Prof. W. S. Barnard, Mr. Jos. Voyle, of Gainesville, Fla., Mr. Clifford Richardson, assistant chemist of the Department of Agriculture, and Mr. H. G. Hubbard, who has for over a year been devoting his time to practical tests in orange groves at Crescent City, Fla.

Passing over the ordinary methods of oil emulsions by phosphates, lactophosphates, and hypophosphites of lime, and various mucilaginous substances, experience shows that, for the ordinary practical purposes of the farmer and fruit grower, soap and milk are among the most available substances for the production of petroleum emulsions.

Ordinary bar soap scraped and rubbed into paste at the rate of 20 parts soap, 10 parts water, 30 parts kerosene, and 1 part of fir balsam, will make, when diluted with water, an emulsion stable enough for practical purposes, as the slight cream, which in time rises to the surface, or the flakiness that often follows, is easily dissipated by a little shaking. Soap emulsions, are, however, less satisfactory and efficient than those made with milk. Emulsions with milk may be made of varying strength, but one of the most satisfactory proportions is 2 parts of refined kerosene to 1 part of sour milk. This must be thoroughly churned (not merely shaken) until a butter is formed which is thoroughly stable and will keep indefinitely in closed vessels and may be diluted *ad libitum* with water when needed for use. The time required to bring the butter varies with the temperature, and both soap and milk emulsions are facilitated by heating the ingredients. Ordinary condensed milk may also be used by thoroughly stirring and beating it in an equal or varying quantity of kerosene.

The diluted emulsion when prepared for use should be finely sprayed upon the insects to be killed, its strength varying for different insects or plants and its effect enhanced when brought forcibly in contact with the insects.

Of mucilaginous substances, that obtained from the root of *Zamia integrifolia*, a plant quite common in parts of Florida, and from the stems of which the Florida arrowroot is obtained, has proved useful as an emulsifier.

These petroleum emulsions have been used with success by Dr. J. C. Neal, of Archer, Fla., against the cotton worm without injury to the plant, but their chief value depends on their efficacy against the different scale insects which affect citrus plants. Experience so far shows that such plants do not suffer from its judicious use, but that it must be applied with much more care to most deciduous fruit trees in order not to injure them.—*Proc. Amer. Assoc.*

Spontaneous Combustion.

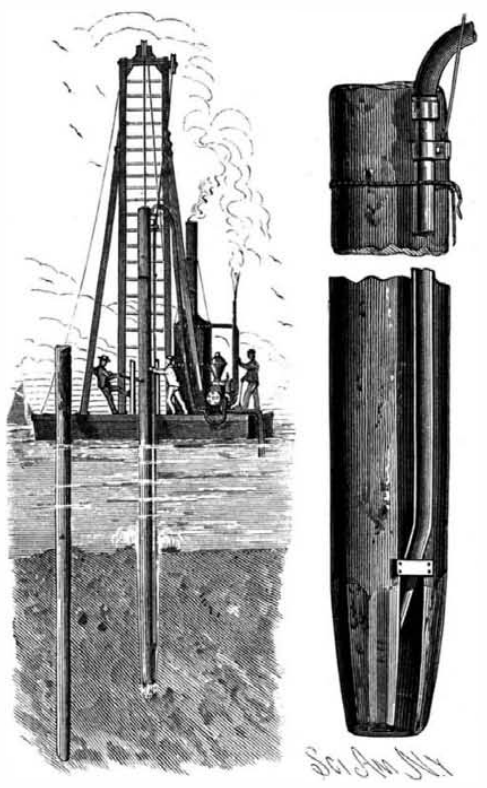
A correspondent of the *Textile Record* says: A fire occurred in a cotton mill at Chester under the following circumstances: A pile of dyed warps was put on the floor of the size house directly after being taken from the drying cylinders. The warps were still warm. Toward morning the watchman noticed smoke issuing from this pile, and upon close examination the warps were found to be on fire. The fire was easily extinguished, but some $300 worth of warps were found to be ruined. The writer visited the mill to study the cause of this fire, and he learned from the superintendent that the heap of warps consisted principally of blue warps with some sized white warps and two bundles of brown warps, the latter being at the bottom of the pile. The superintendent stated that he uses very little tallow in the size for the white and blue warps, but a much larger quantity in the size for the brown warps. He further said that a fire occurred some time ago under similar circumstances in the same place. This former fire was attributed to carelessness of the watchman. We incline to believe that the cause of both the above fires was the combination of tallow and water on the brown warps together with the heat in the warps taken directly from the cylinders, and the pressure of the warps piled on top of the bundles of brown warp. To substantiate this, on examination it was found the brown warps at the bottom of the pile were much more burned than the rest, and that the scorching diminished toward the outside of the pile. Moral: "Never pile up sized warps where taken from the drying cylinder before they have become perfectly cold and dry."

Water Test.

A French periodical, *La Culture*, gives the following simple method for testing the purity of water. In an ordinary quart bottle three parts filled with water dissolve a spoonful of pure white sugar, cork it well, and put it in a warm place. If at the end of forty-eight hours the water becomes turbid and milky, there can be no doubt of its impurity; but if it remain limpid, it may be considered safely drinkable.

HYDRAULIC PILE DRIVER.

The lower end of the pile is provided with a longitudinal groove, which gradually increases in depth toward its lower end, and terminates at the end of the pile. A pipe is so bent that it fits closely against the side of the pile and the bottom of the groove, and its lower end is flush with the bottom of the pile. The pipe is held in place by a block nailed on the pile and across the pipe at its bend, and a rope is passed around the upper end of the pipe and the pile. On the upper end of the pipe is a screw collar, on which a hose coupling can be screwed. Just below the collar is a band having a ring to which is attached a rope passing to a windlass or



HYDRAULIC PILE DRIVER.

other hoisting device. When water is forced through the pipe, the earth is washed away from the end and the pile sinks. After it has been sunk to the proper depth the pipe is pulled up by means of the rope, and is then used with another pile. Driving piles by this plan is easily effected, rapid, and gives satisfactory results.

This invention has been patented by Messrs. J. W. Surprenant and J. E. Ferguson, of Astoria, Oregon.

A NOVEL RUSSIAN BOAT.

Our engraving, which is reproduced from a Russian illustrated paper, represents a peculiar form of boat similar in some respects to the catamaran. It consists of two independent hulls, in the center of each of which is an opening in which the traveler thrusts his feet. When standing, he propels himself by the aid of a long two-bladed paddle, and regulates the distance between the two boats by manipulating the ropes which lead from each bow to the middle of the paddle. When tired he brings the boats alongside one another, places the cross bars in position, elevates his umbrella for a sail, and thus skims swiftly over the water.

A NOVEL RUSSIAN BOAT.

THE herring fisheries of Scotland employ nearly 500,000 people, one-seventh of the population. The boats represent a money value of $3,600,000. The annual yield of cured fish has risen from 99,000 barrels early in the century to 1,290,000, and has trebled in fifty years, while in the same period the value of the nets has increased 75 per cent.

Suggestions to Inventors.

One of our subscribers, a lady, residing in a "thriving portion of the rural West," where the population largely patronize the reaper, sewing machine, and barbed wire manufacturers, sends us the following suggestions:

Practical needle women need another improvement in the sewing machine. The family sewing machine of to-day gives only the two thread stitch; the cheap sewing machines of twenty years ago gave only the one thread, or chain, stitch. Now, the chain stitch is desirable in some cases as an ornamental stitch; it is useful also in cases in which the seamstress expects the seam to be only temporary, and finds the two thread stitch too difficult to rip. We therefore want a machine which can be made to form the lock stitch and the chain stitch, alternately. The most difficult point about the invention will lie in the simplicity of the means used to bring about the change in the stitch. If it could be as easy to cause the machine to change from two thread stitch to one thread stitch as it is to put a hemmer or a ruffler on the machine, the invention would be practical and therefore successful.

A Western farmer asks why a horse hedge trimmer has not yet been invented. If an ordinary mower could be made into a hedge cutter by changing detachable parts, it would be widely used. Thousands of farms on the Illinois prairies are inclosed by Osage orange hedges, which are yearly trimmed with shears.

The Pulse of Animals.

The health of animals as well as that of human beings may often be guessed at very shrewdly by simply feeling their pulse. In a horse a good and strong but quiet pulse beats forty times a minute, in an ox fifty to fifty-five, in sheep and pigs not less than seventy nor more than eighty for ordinary health. It may be felt wherever a large artery crosses a bone. In the horse it is generally felt on the cord which crosses over the bone of the lower jaw in front of its curved position, or in the bony ridge above the eye; and in cattle over the middle of the first rib. In sheep it is, perhaps, easiest to place the hand on the left side, where the beating of the heart may be felt. A rapid, hard, and full pulse in stock points to inflammation and high fever; a rapid, small, and weak pulse also to fever, but to fever accompanied by a poor and weak state of the subject. A very slow pulse in stock will often be found to indicate brain disease, while a jumping and irregular pulse shows something wrong with the heart.—*London Graphic.*

The Java Earthquake and the Telephone.

It has been before observed that earthquakes and volcanic eruptions have a disturbing effect on telegraph lines, setting up powerful earth currents in them, and rendering communication difficult. Recent advices from Mr. Weaver, the Superintendent of the Oriental Telephone Company at Singapore, also announce the fact that during the recent earthquake of Java and eruptions of the volcano of Krakatoa, the telephone lines in Singapore were unworkable, owing to a deafening roar which drowned the voice. Only shouting could be heard on the lines because of the noise, which resembled that of a distant waterfall. On one line, in which a small subaqueous cable about a mile in length, from Singapore to Ishore, formed part of the circuit, the roar was mingled with occasional reports like that of a pistol. The volcano of Krakatoa is situated on the island of that name in the Straits of Sunda, between the southern end of Sumatra and the northern end of Java. It is about 500 miles south of Singapore, with a corner of Sumatra intervening. The noises in question were heard during the eruption on August 27 last, but can hardly be considered, says *Engineering*, as due to acoustical effects, notwithstanding the violence of the eruption. The cause is perhaps rather to be sought in the disturbance of the terrestrial magnetic field or in the electric state of the atmosphere by the terrific explosion. The first signs of the eruption were noticed on August 25, when shocks or earthquakes were felt as far as Batavia, and a fine ash began to fall, intermingled with redhot stones. The waters of the straits then began to boil, their temperature rising some 20° C., and great blocks of lava fell on the neighboring coasts of Java and Sumatra. On the 26th the earthquakes became more pronounced, and at noon the Maka-Meru, the largest of the craters, began to break forth into flame. The Goumang-Gunter and the smaller craters then joined in, until forty-five neighboring craters were in action. Torrents of sulphurous mud and lava burst out, and at intervals tremendous explosions were heard, followed by showers of stone and ashes. The clouds were heavily charged with electricity, and lightnings played vividly. Next day the shocks and eruptions increased, accompanied by tidal waves. The island of Krakatoa, a cut of which we gave in the SCIENTIFIC AMERICAN last week, disappeared, and the destruction was frightful

WITHIN three years the number of sawmills in Arkansas has increased from 319 to over 1,200.

© 1883 SCIENTIFIC AMERICAN, INC

Ancient Ruins in Sonora, Mexico.

Ancient ruins have recently been discovered in Sonora, which, if reports are true, surpass anything of the kind yet found on this continent. The ruins are said to be about four leagues southeast of Magdalena. There is one pyramid which has a base of 1,350 feet, and rises to the height of 750 feet; there is a winding roadway from the bottom leading up on an easy grade to the top, wide enough for carriages to pass over, said to be twenty-three miles in length; the outer walls of the roadway are laid in solid masonry, huge blocks of granite in rubble work, and the circles are as uniform and the grade as regular as they could be made at this date by our best engineers. The wall is only occasionally exposed, being covered over with debris and earth, and in many places the sahuaro and other indigenous plants and trees have grown up, giving the pyramid the appearance of a mountain. To the east of the pyramid a short distance is a small mountain, about the same size, which rises about the same height, and if reports are true, it will prove more interesting to the archæologist than the pyramid.

There seems to be a heavy layer of species of gypsum about half way up the mountain, which is as white as snow, and may be cut into any conceivable shape, yet sufficiently hard to retain its shape after being cut. In this layer of stone a people of an unknown age have cut hundreds upon hundreds of rooms from 6 x 10 to 16 x 18 feet square. These rooms are cut out of the solid stone, and so even and true are the walls, floor, and ceilings to plumb and level as to defy variation. There are no windows in the rooms and but one entrance, which is always from the top. The rooms are about eight feet high from floor to ceiling; the stone is so white that it seems almost transparent, and the rooms are not at all dark.

On the walls of these rooms are numerous hieroglyphics, and representations of human forms with hands and feet of human beings cut in the stone in different places. But, strange to say, all the hands have five fingers and thumb, and the feet have six toes. Charcoal is found on the floors of many of the rooms, which would indicate that they built fires in their houses. Stone implements of every description are to be found in and about the rooms. The houses or rooms are one above the other to three or more stories high; but between each story there is a jog or recess the full width of the room below, so that they present the appearance of large steps leading up the mountain.

Who those people were, what age they lived in, must be answered, if answered at all, "by the wise men of the east." Some say they were ancestors of the Mayas, a race of Indians who still inhabit southern Sonora, who have blue eyes, fair skin, and light hair, and are said to be a moral, industrious, and frugal race of people, who have a written language and know something of mathematics.—*Chihuahua Enterprise.*

Metal Castings of Insects, Flowers, Etc.

One of our foreign exchanges gives the following mode for producing metallic castings of flowers, leaves, insects, etc.: The object, a dead beetle for example, is first arranged in a natural position, and the feet are connected with an oval rim of wax. It is then fixed in the center of a paper or wooden box by means of pieces of fine wire, so that it is perfectly free, and thicker wires are run from the sides of the box to the object, which subsequently serve to form air channels in the mould by their removal. A wooden stick tapering toward the bottom is placed upon the back of the insect to produce a runner for casting. The box is then filled up with a paste with three parts of plaster of Paris and one of brick dust, made up with a solution of alum and salammoniac. It is also well first to brush the object with this paste to prevent the formation of air bubbles. After the mould thus formed has set, the object is removed from the interior by first reducing it to ashes. It is, therefore, dried slowly, and finely heated gradually to a read heat and then allowed to cool slowly to prevent the formation of flaws or cracks. The ashes are removed by pouring mercury into the cold mould and shaking it thoroughly before pouring it out, and repeating this operation several times. The thicker wires are then drawn out, and the mould needs simply to be thoroughly heated before it is filled with metal, in order that the latter may flow in all portions of it. After it has become cold, it is softened and carefully broken away from the casting.

RINGED ADDERS CREEPING OUT FROM THE EGGS, IN THE BERLIN AQUARIUM.

About the middle of August a basket of serpents' eggs was sent to the Berlin Aquarium. They were found by some laborers in a heap of dirt, the old serpents having been killed under the impression that they were poisonous. There were about two hundred eggs adhering firmly together, forming a mass resembling the cocoons of the silkworm.

To the great joy and surprise of Dr. Hermes, the director of the Aquarium, who summoned numerous observers, the eggs began to show signs of life on the second day after being placed in the egg house. Twenty or thirty small serpents known as ringed adders (*Tropidonotus natrix*) broke through the leather-like shell, and after a few minutes crept quickly around the cage. These adders were 16 to 18 centimeters in length, and in color were exactly like their parents, having the well known yellow spot on the back part of the head. Some of the serpents showed at once their love for the water, gliding into the basin and showing great skill in swimming.

RINGED ADDERS CREEPING OUT FROM THE EGGS, IN THE BERLIN AQUARIUM.

The hatching of the other serpents was quite remarkable. The high temperature of the room and the lack of moisture from the decaying earth dried the covering of the eggs, and made it very difficult for the young reptiles to make their longed for entrance into the world. They could only stretch out their heads, their bodies being firmly held by the parchment-like shell. Without assistance the young serpents would have perished. A large place was cut in the shell, and it could be plainly seen how the snakes, firmly twisted together, lay in their narrow prison. They stretched themselves out at once, so that a few minutes afterward none of them could have been forced back into the empty shells. The ringed adder is perfectly harmless. the crescent-shaped yellow spot distinguishing it from the poisonous adder, which has black zigzag lines on the back.—*Illustrirte Zeitung.*

By going a few minutes sooner or later, by stopping to speak with a friend on the corner, by meeting this man or that, or by turning down this street instead of the other, we may let slip some impending evil, by which the whole current of our lives would have been changed. There is no possible solution to the dark enigma but the one word, "Providence."—*Longfellow.*

Varnish.

How many, in looking at a handsomely varnished surface, stop to think that the varnish has other uses than that of imparting a fine finish. Few, we imagine, give it a second thought, so accustomed are they to seeing the lustrous mirror-like surface of carriages and coaches; hence the curiosity which at first may have been excited, and the wonder as to how such results could be obtained, soon become dulled by everyday contact.

The degree of transparency or paleness is one of the means of determining the grade or quality of varnish. A fine sirup has much the appearance of a good varnish. The word varnish covers a very wide field, as the term in its fullest sense can embrace all the thousand and one preparations compounded for as many different purposes, but we shall refer only to one branch, that of varnishes for coach and car work, as it is here that the highest perfection is reached, and the greatest skill and intelligence are required in manufacturing.

Almost any encyclopedia will give the constituent parts of varnish, but the art of making good varnish is not found in type, and can only be learned by patient, painstaking effort and intelligence.

An essential quality of varnish is that it must harden without losing its transparency, as it must not change the colors it is intended to preserve. It must exclude the action of air, because wood and metals are varnished to protect them from rust and decay. It must also be waterproof, else the effect of the varnish would not be permanent. And a point of primary importance is that it must possess durability.

In combining its various ingredients so that the varnish will answer these requirements, and at the same time work freely under the brush, lies the secret and mystery of varnish making, and he who best succeeds in accomplishing it confers upon the world a blessing and upon himself a fortune.

Let us look at a carriage and observe the brilliant surface—smooth as a mirror, and like it, reflecting one's features, though possibly somewhat distorted by a concave or convex panel, as the case may be. The luster appears to have considerable depth, yet we know that it is but slightly removed from the bare wood. Would you suppose that fifteen or sixteen separate coats had been put on to attain this, beginning with the priming or first coat, and following it with various layers, each successive coat suited for its special purpose in this outgrowing process? All must be perfect, else the finished job will suffer, for one coat cannot remedy the defects of another.

New uses are constantly being found for varnish, by which it embellishes the article to which it is applied, affording satisfaction to the buyer and profit to the manufacturer. For it is a truism, that whatever adds to the appearance, whether on animate or inanimate nature, whether the addition comes from "a grace snatched beyond the rules of art" or otherwise, increases the pleasing power of the one and the selling power of the other in a corresponding degree. Art, which in one sense is synonymous with excellence, is entering more and more into the various mechanical pursuits, and the future will reveal a more decided advance than has yet been accomplished.—*Charles Howard, in Western Carriage Journal.*

Boride of Aluminum.

Joly obtained a boride of aluminum, BoAl, in hexagonal golden plates by reducing boracic acid with aluminum in graphite crucibles. These crystals were studied before by Deville and Wohler, being known as boron diamonds. Hampe has taken up their study again. He also obtained Bo_6Al as large black lamellar crystals; also yellow quadratic crystals with brilliant luster inclosing carbon and aluminum. Fourthly, he obtained one or more compounds of boron and carbon, which have not yet been investigated.

© 1883 SCIENTIFIC AMERICAN, INC

Digestibility of Raw and Cooked Meats and Milk.

E. Jessen has recently completed some interesting investigations regarding the time required to digest meat and milk prepared in different ways.

His first experiments were made with artificial gastric juice. Twenty-five grammes of beef were placed in it for 24 hours, and the undissolved portion weighed at the end of that time. Of the raw beef about 5½ grammes only remained, of the half cooked 9½ to 9¾ grammes, while that which was well done left from 17 to 18 grammes.

The next experiments were made on a dog with an opening in the stomach. Here too the raw meat digested more quickly than boiled or roasted meat. The time for raw beef was 5·3 to 5·5 hours.

Experiments were also made upon men by introducing 100 grammes of meat and 300 c. c. of water into an empty stomach; after a certain time the contents of the stomach were pumped out, and if the microscope detected no muscle fibers the digestion was considered finished. The time required was as follows:

Raw beef, shaved fine	2 hours.
Half done boiled beef, shaved fine	2½ "
Well done " " " "	3 "
Half done roasted, shaved fine	3 "
Well done " " "	4 "
Raw mutton	2 "
" veal	2½ "
" pork	3 "

In the experiments with milk such a quantity was given as to correspond in the quantity of nitrogen it contained to 100 grammes of beef. The time was as follows:

602 c. c. raw cow's milk	3½ hours.
602 c. c. boiled cow's milk	4 "
602 c. c. sour " "	3 "
675 c. c. skimmed cow's milk	3½ "
656 c. c. raw goat's milk	3½ "

—*Zeitschrift fur Biologie.*

New Source of Caoutchouc.

The attention of the Indian Government has been drawn to a new plant, which is common in southern India, and yields abundant supplies of pure caoutchouc. It is an apocynaceous plant called *Prameria glandulifera*, the native habitat of which appears to be in the forests of Cochin China, where the liquid juice is often employed in medicine by the Annamites and Cambodians. In China it is called *tuchung*, and is a frequent ingredient in the Chinese *materia medica*, in the shape of blackened fragments of bark and small pieces of twigs. It is imported into that country from Cochin China, the price of the bark after being smoke dried being about 20s. the picul (133 pounds). When broken, the twigs are seen to contain an abundance of caoutchouc, which can be drawn out into threads as in the East African landolphias. The plant may be propagated by cuttings, and M. Pierre, director of the Botanic Gardens at Saigon, thinks that it may be planted in forest reserves when the trees are not less than ten years old, and that an addition may be made to Indian forestry of great economic value.

ADJUSTABLE PIPE WRENCH.

On the working end of the handle is a thread, cut preferably between the V and square thread—a little flat at both the top and bottom—thus doing away with the sharp edges of one and the square corners of the other, and producing a thread not so susceptible to injury from rough usage. On the screw threaded portion of the handle is a nut, attached to the sides of which, by forks, is an angular serrated jaw, the teeth of which extend to the second angle from the end. On the extremity of the handle is a reversible fixed head having opposite concave serrated gripping surfaces. The forked portion of the jaw is of diverging construction toward the nut to which it is pivoted, thereby insuring increased strength. The reversible form of the head or fixed jaw gives a more varied gripping surface, and consequently reduces wear; and as the serrated surfaces of the head are concave in direction of the length of the head, the hold or grip is better than if obtained from a convex form. The nut is long, and has two of its opposite sides flattened to form bearings for the forked end of the swinging jaw. This method of construction produces a cheap, simple, and durable wrench having an easy and extensive adjustment. Its form and application will be readily understood from the engravings. The wrench will work equally well on round, square, flat, or any number of sides, and can be made in sizes to suit the requirements; and when made of steel, as contemplated by the inventor, will be strong and light. If desirable, the opposite serrated sides of the fixed jaw may be at different angles to suit varied kinds of work, and, if deemed essential, the swinging jaw may be made with a rib along its back to insure greater strength, and may also be made of a concave instead of an angular form.

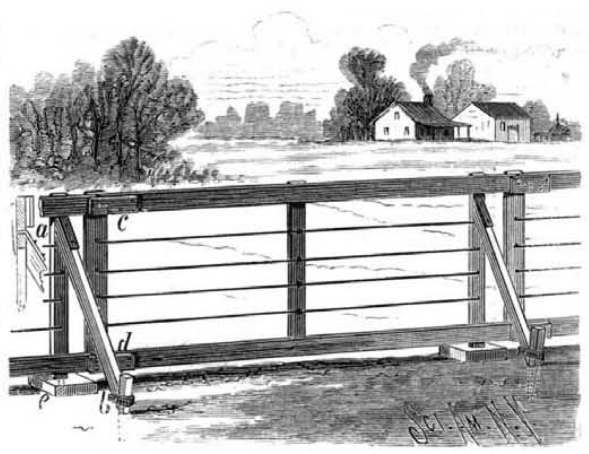
This invention has been patented by Mr. James L. Taylor, of Ishpeming, Mich., who will furnish further information.

A Rainbow in a Clear Sky.

At Waterbury, Conn., about half-past eleven o'clock in the morning of October 30, while the sky overhead was clear and blue and the sun shone down with a warm and genial smile, there suddenly appeared in the northern heavens a rainbow of wondrous beauty and brilliancy. For about five minutes throngs of people gathered upon the sidewalks and other convenient places to observe the phenomenon, which then gradually faded away.

PATENT FENCE.

The fence shown in the accompanying engraving is constructed in sections or panels of a convenient length for handling, and consists of top and bottom rails, end posts, and one or more intermediate parts. For intermediate rails, wood or metal bars are used, but rods or wires, secured to the uprights by staples, are preferable. In order that the panels may be easily joined, the upper and lower rails of one panel are extended so as to lap upon the edge of the post of the adjoining panel. The end post of one section is secured by a dowel pin to a ground block, *e*. The panel thus supported is the one having the projecting rails. The joint of the upper rails is so made that the panel whose rails do not project will rest upon the other. Cleats, *c*, are fixed to the sides of the rails to keep the panels in line. The fence brace is beveled at both ends, and has at its top the lock plate,



RIGG'S IMPROVED FENCE.

shown at *a*, which is bent at right angles to the bevel and passes through an aperture in the post, projecting from the other side sufficiently to receive a locking key. At the foot of the brace is secured, by a suitable pin, the yoke plate through which the stake is driven firmly into the ground. This stake is made wedge-form, so as to tighten against the beveled end of the brace and yoke in a manner to prevent any rise of the foot of the brace.

This invention has been patented by Mr. James W. Rigg, of Mount Carmel, Illinois.

Nordenskjold's Greenland Exploration.

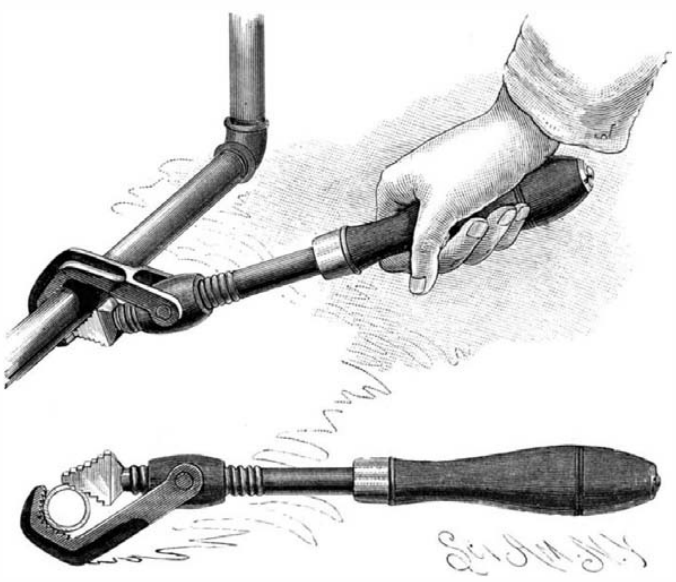
Baron Nordenskjöld has telegraphed to us, from Thurso, the results of his Greenland expedition. His work has not been wasted. It shows us, for the first time, what the interior of Greenland is like, and though it is very unlike what Baron Nordenskjöld imagined it to be, it has furnished him with evidence in favor of his theory that the volume of the globe has been increased by the cosmic dust that has been constantly falling upon it from the lucid interspace that surrounds it on all sides.

Greenland, Baron Nordenskjöld held, must have reason for the name it bears. It could not be the mere waste of ice which it has been supposed to be. The coast line, it is true, is forbidding enough, and gives slender promise of anything better beyond. But as long as the interior was unvisited there was ample room for hope. The moist ocean winds which blow upon Greenland could be assumed to have spent their force and to have deposited their burden of snow upon the high mountains of the coast. Further inland the scene might be expected to change, and to reveal verdant oases, covered with vegetation, with grass and shrubs and flowers cut off for long ages past from intercourse with the outer world, and possessing, therefore, peculiarities of their own, fit objects of study to the scientific naturalist. Such were Baron Nordenskjöld's anticipations. His report tells us nothing in confirmation of them.

His expedition to the interior has penetrated a long way into regions never before traversed. It has found mountains, it has found snow, it has found ice, and it has found cosmic dust, but it has not found the oases of which it was in search. The main body of the party were stopped short at a comparatively early point. They started, on the 4th of July, from the west side of Greenland and made their way inland for 140 kilometers, reaching a height of 5,000 feet. Here the soft snow rendered it impossible for their sledges to proceed. The Laplanders who had accompanied them were then sent forward on foot with snow shoes, and made their way for another 230 kilometers in advance of the rest. The ground rose as they went, but the state of things remained otherwise substantially the same. There were higher mountains and more snow and ice, but no verdant plateau, and no sign whatever to give them hope that they were on their road to it. As for the cosmic dust, there seems to have been no need of keeping the intended keen look-out for it. There was dust everywhere, whether of cosmic origin or not, but curiously placed at any rate, and demanding to have its presence accounted for. Thus far, then, although Baron Nordenskjöld has not been successful in forcing a passage from one side of Greenland to the other, and although he has seen and heard nothing of the warm fertile interior he expected to find, he can claim at least to have discovered something of the nature of an ice-covered continent, and to have shown the way to future discoverers who may be led to follow in his footsteps, and who may not impossibly outstrip him.

While this visit to the interior of Greenland was in progress, the rest of the expedition were exploring the northwest coast. Their results have been neither few nor unimportant. They have come back with rich collections of zoological, botanical, and geological specimens. Their report of the region is favorable for future visitors. The glaciers in the neighborhood are few and not great; the fiords are free from ice and likely, as a rule, to be accessible for suitable vessels during the summer months of the year. The expected cold current along the coast has been found to exist, but it is pronounced to be insignificant. In their subsequent visit to the east coast of Greenland, Baron Nordenskjöld and his companions have been forestalled by earlier visitants, for they have found traces of Norman remains some centuries old but from the fifteenth century to the present year there have, Baron Nordenskjöld declares, been no ships anchored there but his own. In such circumstances the title of discoverer may fairly be considered to have lapsed, and to belong by right to the latest claimants, to Baron Nordenskjöld and his companions.

Such is the summary which Baron Nordenskjöld sends us of the results he has attained. He has struck out a new line and has added a chapter different from all the rest to the records of Arctic exploration. His work for this year is at an end, but it is not likely that he will be content with what he has done. It has not been his first voyage of exploration to Greenland, and we do not suppose it will be his last. The passage across Greenland remains still unaccomplished; possibly the mirage of the green lands of the interior remains still floating before Baron Nordenskjöld's eyes, and tempting him onward to test the reality of the vision.—*London Times.*



TAYLOR'S ADJUSTABLE PIPE WRENCH.

A Proposed New Pipe Line.

A number of Philadelphia and Boston capitalists have formed an organization which has in view the laying of a pipe line from the new salt wells in Western New York to some point in the Lehigh coal region. The consumption of coal in the evaporation of brine at the wells is very considerable, and the projectors of the pipe line aver that the waste coal, or culm, that has accumulated in the coal regions, and cannot be utilized by any industry there, could be used to advantage in the evaporation of brine. Experienced salt men say that the brine running through the pipes would be thick with iron rust when it reached the works, and, unless some chemical action could be brought to bear on it to purify it, would be worthless.—*Iron Age.*

It is not true that the passage of salt water through cast iron pipes would so far disintegrate the iron as to cause a discoloration of the water. Pipes of cast iron speedily take up the depositions of the water going through them, and do not make saline deposits when there is a current, and other deposits, alkaline or of ordinary minerals, are made only in a sluggish current. The use of salt water pipes on shipboard for exhaust steam and for pumps show the folly of this objection to the pipe line, in consequence of the erosion of the pipe because the water is salt.

Standard of Education.

According to Ruskin, an educated man ought to know these things: First, where he is—that is to say, what sort of a world he has got into; how large it is, what kind of creatures live in it, and how; what it is made of, and what may be made of it. Secondly, where he is going—that is to say, what chances or reports there are of any other world besides this; what seems to be the nature of that other world. Thirdly, what he had best do under the circumstances—that is to say, what kind of faculties he possesses; what are the present state and wants of mankind; what is his place in society; and what are the readiest means in his power of attaining happiness and diffusing it. The man who knows these things, and who has his will so subdued in the learning of them, that he is ready to do what he knows he ought, is an *educated* man; and the man who knows them not is uneducated, though he could talk all the tongues of *Babel.*

© 1883 SCIENTIFIC AMERICAN, INC

ENGINEERING INVENTIONS.

Mr. Thomas H. James, of Republic, Mich., has patented a simple car coupling which relates to the drawheads of cars in which the common link and pin are used as couplers, whereby it is made automatic in its action, and the parts are rendered accessible.

An improved railroad gate has recently been patented by Messrs. D. McNeely and J. A. Drake, of Princeton, Ind. This gate is automatic in its action, being raised by the action of the cow catcher upon upright arms, which arms serve to deflect bars at the side of the track, thereby elevating the gate. The gate is retained in its raised position by the action of the wheels of the cars upon the bars located at the side of the rails.

MECHANICAL INVENTIONS.

Mr. Charles L. Heisler, of Wapakoneta, Ohio, has obtained a patent for an improved vegetable cutting machine. This machine is provided with a cylinder having knives arranged in its outer surface, the whole so arranged as to be rotated in its bearings, and so constructed that the slices as they are cut will be deposited in the receptacle prepared for them.

Mr. J. O. Madison, of New York city, has patented an improved instrument for dividing lines into any desired number of equal parts. The invention consists in a series of cog wheels having different diameters and mounted on the same shaft, combined with a series of racks engaging with the cog wheels at diametrically opposite points, so that they will move in opposite directions when the cog wheels are rotated.

An improved fire escape has recently been patented by Mr. C. J. Lung, of Rochester, N. Y. It consists of an endless ladder of wire ropes arranged on grooved drums or pulleys at top and bottom, the pulleys being mounted in brackets projecting from the side of the building, and the ladder having an air brake contrivance connected with it, to regulate the descent of persons by the running of the ladder on the pulleys by the weight of the persons on it. Guides are provided to prevent the ladder from swinging forward and backward in case of being slack on the pulleys.

Messrs. L. H. Coburn, of Seneca, Kas., and E. D. Thompson, of Havana, Ill., are the patentees of an appliance for stripping and heading sorghum and sugar cane. This apparatus consists in a table or carrier for feeding the cane, a series of strippers and beaters or scrapers, and a suction fan or device and draught tube, which is adjustable for stripping the leaves from the cane and removing them, together with all dust, dirt, insects, and foreign substances. It also includes devices for cutting off and removing the heads from the cane. The apparatus will largely economize labor, it is claimed, and should prove a valuable adjunct to the equipment of both large and small plantations.

A patent has been recently issued to Mr. Asa Leas, of West Manchester, Ohio, for a scoop balance attachment for weighing scales. The object of the invention is for automatically balancing the weight of the scoop, so that only the net weight will be weighed by the scale. It consists of a lever under the platform, whereon the weight of the scoop is balanced by means of a stud projecting from the center of the bottom of the scoop into a hollow space in the upper part of the platform standard, and bearing on a stud projecting up from the arm of an intermediate lever having a fulcrum on the main lever, and bearing at its other end against the under side of the platform; the levers being so adjusted that they bear upward against the stud of the scoop with a power equal to the weight of the scoop.

AGRICULTURAL INVENTIONS.

Among the recent inventions in harrows is the patent of Mr. A. A. Werts, of Big Creek, S. C. The invention consists in connecting together a number of small triangular harrows by suitable connecting bars. The harrows are adjustable according to the work to be done and the width of rows to be planted, and further they are reversible on their pivots, so that they may turn and yield to any obstructions that may be in the way. This machine may be used with either two or three horses; in the former case, two of the harrows may be removed in order to lighten the draught.

Mr. Walter G. Gray, of Ringgold, Tenn., has recently patented a corn planter constructed with a seed receiving box having a seed dropping slide, and provided with spring-pressed plates for controlling the removal of seed from said box. With the seed dropping slide is connected an elbow lever, a spring, a crank shaft, a bent hinged bar, and their connecting rods, whereby the seed will be dropped by the descent of the hinged bar into a cross furrow. With the seed dropping slide, the elbow lever, and the spring are also connected a crank shaft, a connecting rod, and a cord, whereby the seed can be dropped by hand.

A combined chopper and cultivator has been patented by Mr. Ellison A. Daniel, of Bluff Mills, Texas. The frame of the machine is V-shape, and the plows are arranged upon this in suitable position and relation, and all is so contrived that the driver from his seat may operate the plows to any required depth or may hold the plows entirely above the ground. The driver is also able to shift the plow frame directly backward or forward and also give the frame lateral play, so that the plows may be moved so as to avoid any plants which may have been set in the ground out of proper line.

Mr. Louis Gairaud, of Santa Clara, Cal., has recently obtained a patent for a simple device for marking off land to facilitate the planting of trees. The invention consists in a land marker constructed with two parallel bars provided with adjustable slides, carrying plow standards and plows, and with adjustable handles. Several plows may thus be secured at equal distances apart upon the parallel slides, and several lines drawn across the field simultaneously, one of the end plows being drawn along a furrow previously made, thus regulating the equal distances of the lines apart. After the field has been marked with parallel lines the machine is drawn across the field at right angles to the first marking, and the plants are set at the points of intersection.

MISCELLANEOUS INVENTIONS.

Mr. Lee Roy Arthur, of Glen's Falls, N. Y., is the patentee of a simple contrivance for turning small sacks, as the fingers of gloves and other like articles of leather or cloth that are required to be turned after being sewed up, so that the seams will come on the inside.

A very simple and effective coal sieve has recently been patented by Mr. J. G. W. Putnam, of Saratoga Springs, N. Y., which is so constructed that the coal and ashes can be sifted with very little labor, and the spreading of the dust is avoided.

Mr. Volkert Van Vleck, of New York city, has secured a patent intended to promote strength and durability in dental plates, and also to secure a more accurate fit and a more natural expression to the face than is practicable when the plates are made in the ordinary manner.

An improved animal shears have been patented by Messrs. L. D. Gleason and R. A. Holt, of Lebanon, Mo. This invention relates to shears for shearing sheep, and provides a pair of shears which holds the skin of the animal stretched during the action of shearing, to prevent the skin from puckering up between the blades of the shears.

Mr. Michael Sexton, of New York city, has recently received a patent for an automatic flushing tank constructed with a series of graduated tanks placed one above the other, and provided with connecting siphons and a vent pipe, whereby a fixed quantity of water will be discharged automatically and at regular intervals of time into the place to be flushed.

An improved stove pipe and chimney attachment has recently been patented by Mr. J. M. Egnor, of Catskill, N. Y. The object of the invention is to form an upwardly tapering jet tube, which guides the products of combustion to the center of the pipe and prevents the air through which said products are ascending from forming a downward cold current to the fire, thereby preventing what is known as a "smoking pipe or chimney," and making a more uniform and thorough burning of the fuel.

Mr. John E. Evans, of Spanish Fork, Utah Ter., has recently patented a barbed wire fence. It consists in an arrangement of stellate or wheel barbs within loops of the fence wires, said wheel barbs being mounted horizontally on a couple of pointed wires, each having one end looped for interlocking with each other and passed through or around the opposite strands of the loops of the fence wires, the straight, or perpendicular, and interlocked barbs forming the axis on which the wheel barbs freely rotate.

Mr. D. C. Baughman, of Albion, Ind., has recently patented a device for opening and closing the cocks or valves of gas burners from a distance by automatic means, more especially street lamps, so that the lamps of a given district or section can be extinguished at once, and also lighted simultaneously by electricity. The invention consists in valve chambers combined with the burners and connected by air pipes, so that by pressure of air the valves or cocks can be moved.

Messrs. Alfred Roovers and Alexander Roovers, of New York city, have recently received a patent for an improved electric cane constructed with two tubular sections connected with each other and the lower section by non-conducting couplings, and provided with a battery and an induction coil connected by a screw, a rod, and wires with the metallic head and ferrule of the cane. The object of this cane is to provide a galvano electric machine for remedial purposes, which can be easily and conveniently carried.

Mr. Walter S. Phelps, of Wortendyke, N. J., has recently secured letters patent for a simple and effective device for placing torpedoes on the tracks of railways in case trains are to be signaled and stopped during foggy weather or at night. The invention consists in a box adapted to contain a series of torpedoes and provided with a sliding bar which grasps the torpedoes and carries them out of the box and holds them on the rail, to be exploded by the wheels of a passing train, to which bar torpedoes are fed automatically by a spring contained in the box. The torpedoes are fed through a spout on the end of the box toward the rails, the spout being provided with a hinged gate, which is automatically locked in position when no torpedo is held on the rail.

A patent has been issued to Mr. Homer E. Jenne, of Ben Lomond, Cal., for an improved interest indicator. This invention consists of a weighted disk provided with interest or other tables on its opposite faces, and journaled between two graduated stationary circular screens of the same diameter, provided each with a pointer and a slot, whereby the figures on the opposite faces of the disk and opposite the windows can be read. The circular screens are secured at their circumferences to a metal band provided with a hooked arm adapted to engage in the socket of a plate secured to a wall or other object, whereby the indicator may be turned around when desired, the metal band being provided with a brake to hold the disk in any desired position.

An improved steam cooking apparatus has been patented by Mr. James M. Johnson, of Northumberland, N. H. The invention consists in a cooking steamer constructed with a vessel having inwardly projecting beads near its upper and lower ends, and provided with a perforated lower partition, a close upper partition, and a water return pipe. The cover of the vessel has a conical top, and is provided with an annular trough and a water discharge pipe. Upon the top of the cover are two compartments, provided with wire gauze screens and discharge faucets. With this construction the cooking will be done with live steam under pressure, so that the substance being cooked will not become soggy or water soaked, and will be quickly and thoroughly cooked.

NEW BOOKS AND PUBLICATIONS.

ILLUSTRATED CATALOGUE. Poole & Hunt, Engineers and Machinists, Baltimore, Md.

In this catalogue the publishers have most attractively presented the many good features of their Leffel turbine water wheel. The book is copiously illustrated with fine engravings showing some of the many applications of their wheel. The subject matter consists of descriptions and valuable tables, and the publishers have set a commendable example by omitting all recommendations and certificates.

A TEXT BOOK OF INORGANIC CHEMISTRY. By Professor Victor Von Richter, University of Breslau. Translated by Edgar F. Smith, A.M., Ph.D., Professor of Chemistry in Wittenberg College, Springfield, Ohio. P. Blakiston, Son & Company, 1,012 Walnut Street, Philadelphia, Pa.

With its eighty-nine illustrations and a chart of the spectrum this volume is a valuable "text book" as its title indicates. The "special part" contains an epitome of natural philosophy as applied to inorganic materials, that is in itself a text book to natural phenomena; and the department devoted to metals is particularly full of hints, suggestions, and directions to metal workers. The book, which is in a convenient form, is at once an instructor and a technical guide. The composition of the metals and the uses of their oxides form no inconsequent portion of the volume.

Notes & Queries

HINTS TO CORRESPONDENTS.

No attention will be paid to communications unless accompanied with the full name and address of the writer.

Names and addresses of correspondents will not be given to inquirers.

We renew our request that correspondents, in referring to former answers or articles, will be kind enough to name the date of the paper and the page, or the number of the question.

Correspondents whose inquiries do not appear after a reasonable time should repeat them. If not then published, they may conclude that, for good reasons, the Editor declines them.

Persons desiring special information which is purely of a personal character, and not of general interest, should remit from $1 to $5, according to the subject, as we cannot be expected to spend time and labor to obtain such information without remuneration.

Any numbers of the SCIENTIFIC AMERICAN SUPPLEMENT referred to in these columns may be had at the office. Price 10 cents each.

Correspondents sending samples of minerals, etc., for examination, should be careful to distinctly mark or label their specimens so as to avoid error in their identification.

(1) W. E. T. asks how to prevent nickel plating from rusting, and also how to restore its brilliancy. A. Nickel plating if well done on solid metal ought not to rust. If on cast iron which is porous, the nickel will be also porous if not thickly plated. You may oil the articles with linseed oil and heat to a little above the temperature of boiling water. Then polish with whiting, chalk, or electro-silicon. The oil fills the pores and prevents future rust.

(2) E. H. M. asks the meaning of all the figures in framing squares manufactured by Sargent & Co. Also if there are any fractional threads in pipes, and what is standard measure for any given size. A. For full explanation of the use of the carpenter's square, see the SCIENTIFIC AMERICAN SUPPLEMENT Nos. 88 and 89.

Iron pipe, ⅛ has 27 threads.
¼, ⅜ 18 threads.
½, ¾ 14 threads.
1, 1¼, 1½, 2 11½ threads.
2½ and up 8 threads.

For bolts the usual threads are:
¼, ⅜ 16 threads.
½ 12 threads.
⅝ 11 threads.
¾ 10 and 11 threads by different makers.
⅞ 9 and 10 threads.
1 8 and 9 threads.
1¼ 8 threads.

There has been much effort to harmonize the bolt threads among makers, but without success. Many machine shops have variations from the above.

(3) W. S. asks: What is malleable iron, and how made? A. Malleable iron is cast iron deprived of most of its carbon by burning out in melting; then casting as with ordinary cast iron; then annealing at a red heat for several days, the castings being embedded in an oxidizing material, generally pulverized hematite or anvil scales. Cast iron boxes are used for packing the pieces in, and for convenience of handling.

(4) W. K.—For staining wood black, see SCIENTIFIC AMERICAN SUPPLEMENT No. 207, page 3301. Brazil wood is used for producing red stains. Thus: Take 1 pound of Brazil wood to 1 gallon of water, boil three hours with 1 ounce pearl ash, brush it hot on the wood, and while hot brush the wood with a solution made with 2 ounces of alum in 1 quart of water.

(5) A. F. S. asks (1) how to finish mahogany wood in French polish, such as is usually applied in finishing photographic cameras; and can it be finished in a darker shade than the wood, where it is of light shade? A. We would recommend you to use a red stain such as the following: Boil 1 pound Brazil wood and 1 ounce pearl ash in a gallon of water; brush over the work until of proper color. Dissolve 2 ounces alum in 1 quart water, and brush the solution over the work before it dries. Take a gallon of the above stain, add 2 ounces more pearl ash, use hot, and brush over with the alum solution. Then polish until of satisfactory tint. 2. Also how to finish maple to imitate mahogany? A. Mahogany stain on maple: Dragon's blood, ½ ounce; alkanet, ¼ ounce; aloes, 1 drachm; alcohol, 16 ounces. Apply with a sponge or brush.

(6) J. R. asks (1) how to extract alumina from clay on a small scale. A. Aluminum is prepared in decomposing the double chloride of aluminum and sodium, by heating it with metallic sodium, fluorspar or cryolite being added as a flux. 2. How to extract metallic sodium from common salt? A. Sodium is obtained by distilling a mixture of sodium carbonate with charcoal and chalk in the following proportions: Dry sodium carbonate, 717 parts; charcoal, 175 parts; chalk, 108 parts. 3. How to extract magnesium from any one of its compounds? A. Magnesium may be prepared by the electrolysis of the magnesium chloride (fused) or by the reduction of magnesium chloride with metallic sodium. For details in regard to these methods, consult Roscoe and Schorlemmer's Treatise on Chemistry.

(7) W. K. A. asks (1) if gutta-percha plates will answer in place of glass ones in the Toper-Holtz machine. A. Gutta-percha, or rather vulcanized rubber, has been used for the plates of a Holtz machine, but it is neither as cheap nor as good as window glass. 2. If they will answer, do they need varnishing? A. If used, it would probably be well to varnish them with shellac. 3. What will cement hardwood to glass or gutta-percha? A. Owing to the shrinking and swelling of wood by hygrometric changes, an elastic cement is required. Equal parts of pitch, gutta-percha, and shellac will answer the purpose. Hard rubber or vulcanized fiber would be better than wood.

(8) C. M. asks: 1. Is electricity ever used for warming houses or for cooking food? A. Experiments have been made in this direction, but this method of heating is very expensive. 2. Is a shrill note, or a low, dull note heard at the greatest distance? A. Experiment shows that the lower notes are heard the farthest. 3. Has the experiment of warming houses and of supplying steam for other purposes by using boilers situated a long distance from the place of its use, been successful? A. Steam is conducted long distances for heating and power purposes. Companies have been formed in New York and pipes laid for supplying steam for manufacturing and heating purposes on this principle. 4. Would two cannon balls of equal size and weight, fired from a gun on level ground, using the same quantity and quality of powder, the gun to be elevated at an angle of 45 degrees—under such conditions, would the ball, thrown exactly in a westerly direction, reach the same distance as the other ball thrown in exactly an easterly direction? A. There would be no appreciable difference.

(9) W. T. A.—Hand punches such as watch makers use for punching springs will punch holes in hoop skirt wire. Drill in a small drill press if you wish to save drills. Probably you use too much pressure upon the drill. Any jeweler in your place could tell you all you require to know about drilling small holes.

(10) M. W. T. writes: To settle a controversy, will you kindly give a comprehensive definition of momentum and inertia? The text books at hand are too indefinite upon the subject of momentum, saying simply that it is velocity multiplied by mass. Yet they say that it is "on account of" inertia that a ball keeps in motion after it has been projected from the hand. That, it seems to me, conveys an erroneous impression, for inertia is not a force which can carry a ball. By inertia we understand the incapability of a body to move itself while at rest, or to stop itself while in motion; that is to say, its incapability of doing anything; a purely negative quality, which is always the same in a body whether it is at rest or in motion. If mass is multiplied by velocity, the result is certainly a live force. The exertion of throwing a ball converts muscular force into motion, and this through the medium of the ball is delivered in the form of heat, etc. Thus the ball while between the points of impulse and impact is possessed of the force. What is the name of that force? It is not impulsive force, for that ends with the effort. It is not inertia, for inertia is not a force. A. According to Newton's law, "a body if in a state of rest or motion continues to be ever in a state of rest or motion unless acted upon by some extraneous force." In both these cases the body is in a state of inertia. To say that a body when once set in motion continues to be in a state of motion on account of inertia is simply to assert that it is obedient to Newton's law. It is set in motion by some extraneous force, but it continues in motion forever in a straight line on account of the absence of any force to deprive it of its motion, *i. e.* on account of inertia. "Inertia is that property of matter which cannot of itself change its own state of motion or of rest" (Ganot). We think that the difficulty you experience about momentum is due to your misapprehension of the meaning of the word. Momentum is not a force; it simply measures the force which has been communicated to a body. "Force is any cause which sets a body in motion or which changes the magnitude or direction of its velocity if in motion" (Ganot). We should say therefore, when force has been expended in setting a body in motion, that "between the points of impulse and impact" the body was possessed of energy. In what way this energy will develop itself when brought into relation with some other body or bodies, as air, body at rest, body in motion, etc., can only be determined by the conditions.

(11) B. W.—The black coating on the sample of zinc received we take to be bronzing. The following is used for that purpose: 1. Dissolve 5 drachms iron nitrate in 1 pint of water. 2. 5 drachms iron perchloride in 1 pint of water. 3. Dissolve 10 ounces arsenic chloride in spirits iron perchloride and 1 pint of water. 4. Japanning and japans; for full information on this subject see article with above title on page 5040 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 316.

© 1883 SCIENTIFIC AMERICAN, INC

(12) C. H. S. writes: Please give me through your paper a receipt for bronzing castings. A. For bronzing brass castings—dip the articles in a bath composed of: Hydrochloric acid, 6 pounds; sulphate of iron, half a pound; white arsenic, half a pound, until black. Then wash in hot water. Dry in sawdust, polish to suit the taste with plumbago, and brush and lacquer.

(13) W. D. S. asks: In filing a meat saw, should the teeth be filed square across from one side, every tooth, or every other one? or should the file be inclined to the left? A. A meat saw should be slightly set, and filed from both sides on every other tooth, and not square, but slightly inclined, like a saw for cutting wood. The teeth should also lean forward more than a wood saw.

(14) W. H. M. writes: I would like to know how to prepare small pieces of wood so as to make them suitable for kindling purposes. It is now waste, and if I could bundle it and then dip in some cheap material that would light readily with a match, it would turn an almost useless article to some account. What material can be best used for the purpose above mentioned? A. Small pieces of wood that can be bundled should sell readily for kindling without addition of inflammable matter. It is a commercial article in New York. Kindling waste and sawdust united and pressed with an admixture of melted resin has been sold in New York, resin or pitch being a very cheap inflammable cement.

(15) F. A. G.—For your dialytic telescope make the object glass or front lens a plano-convex 4½ inches diameter, 39 inch focus, plane side next the eye, of crown glass. For the correcting lens, use flint glass 2½ inches diameter, 27 inch negative focus, plano-concave, concave side next the eye. Arrange the tube so as to move the flint lens a short distance for a final adjustment. This will give a focal length of about 6 feet for the telescope.

(16) F. A. W. asks how liquid India ink is prepared, *i. e.*, how the lamp black is kept suspended or in solution. A. A very black and indelible drawing ink may be made by dissolving shellac in a hot water solution of borax, and rubbing up in this solution a fine quality of India ink; this may be made by rubbing down a genuine India ink with good black ink until it flows easily from the pen. 2. Mix finest lampblack with a solution of 100 grains lac and 20 grains borax in 4 ounces of water.

(17) A. J. M. asks how and where anchor ice is formed—whether at the bottom or surface of a stream. A. Anchor ice is formed at the bottom of running streams. The agitation of the water prevents it freezing at the surface, although it may be at a temperature several degrees below freezing. The low temperature is imparted to the stones or rocks at the bottom. The water freezes in thin films by contact, and it continues to grow thicker by the constant contact, with the water below the freezing point.

(18) F. P. writes: I wish to build a ram and have a valve that will do for an outlet valve with an opening 4¾ inches diameter, fall 18 inches, elevation 10 feet, distance 200 feet, plenty of water. Please give me best size and length of feed pipe, best size of check valve, and how much drop for outlet valve. Please mention if the feed pipe must be a special size to suit ram, or if any size will do if large enough. I wish to make a square one of boards, and would like dimensions given accordingly. A. If your supply pipe is 4¾ inches diameter, the discharge may be 2¼ inches, and the check valve should be nearly the size of the supply pipe. Any size will do if large enough, but it must not be so large as to reduce velocity due to the head, less friction.

(19) W. F. R.—The water in a steam boiler is quiet, provided no steam be drawn from the boiler; but when steam is drawn off, the bubbling and boiling is the same as in an open vessel.

(20) G. H. I. asks how the lettering is put on polished steel, such as razor blades or hand saws. I am aware he says that it is cut in with an acid, but could you possibly tell me how it is applied and what tools are used? A. The etching of razors and saw blades is done by drawing with a fine hair brush the design or letters in asphalt varnish; also cover all other parts with the varnish and dip in an acid bath. If the design is very small, a rim of beeswax may be set around the design or name. A few drops of the acid put within the rim will cut or bite the figure. Another way is to cover the whole with etching varnish or wax and scratch the design into the wax, and then bite with acid. For the acid: To 1 gill acetic acid or good, strong vinegar, 20 drops nitric and 20 drops sulphuric acid with half a teaspoonful of salt. You can make the asphalt varnish in a close bottle, using asphaltum and spirits of turpentine; set the bottle in warm water until the asphaltum is dissolved. Make it thin, so that a trial with the brush makes a fine, smooth line.

(21) T. H. H. asks the respective distances through which light and electricity passes per minute. A. The velocity of light is 190,000 miles in a second. According to Wheatstone's experiment, the velocity of electricity is 288,000 miles in a second, but the velocity of an electrical current through a wire, according to Kirchhoff, is far less; something like 192,924 miles in a second.

(22) A. W. asks the time in years it takes the magnetic pole to make one revolution round its circle, and the radius or diameter of that circle as near as it has been discovered. A. We do not know that the magnetic pole or poles, for there are four of them, or two north and two south—a strong pair and a weak pair, are moving as you describe. The strong north pole is in the vicinity of the head or north end of Hudson's Bay, in about 70° north latitude, 85° west longitude. It appears to be moving in what was at first supposed a great circle around the terrestrial pole, but probably only swinging in an orbit of unknown form and approximate diameter, which we cannot assign with our present knowledge.

(23) R. L. N.—For repairing mirrors accidentally scratched, clean the bare portion of the glass by rubbing it gently with fine cotton, taking care to remove any trace of dust and grease. If this cleaning be not done very carefully, defects will appear around the place repaired. With the point of your knife cut upon the back of another looking glass around a portion of the silvering of the required form, but a little larger. Upon it place a small drop of mercury; a drop the size of a pin's head will be sufficient for a surface equal to the size of the nail. The mercury spreads immediately, penetrates the amalgam to where it was cut off with the knife, and the required piece may now be lifted and removed to the place to be repaired. This is the most difficult part of the operation. Then press lightly the renewed portion with cotton, and the glass presents the same appearance as when new.

(24) A. M. asks: 1. Do not all boiler explosions proceed from a gas that is generated in the boiler? A. No. 2. If all parts of a boiler, including flues and crown sheet, which come in contact with fire, were kept covered with water on the opposite side, could explosions occur? A. Yes.

(25) I. H. M. asks: Is it possible to siphon water from a well 72 feet deep, with 8 feet fall from bottom of the well, with 1 inch pipe (which seems to be tight, but when it is turned on but little the water will run)? There are 30 feet of water in well. Would a check valve be of any use in the well? A. Eight feet fall would be hardly sufficient to overcome the friction in a 1 inch pipe of that length. You should use not less than 2 inch pipe, if you wish to get any quantity of water. A check valve would save the necessity of charging the siphon every time you wish to put it in operation.

(26) E. M. D. writes: I wish to run a 3 inch Cornish lift pump in a mine shaft 60 feet deep, and raise about 1,000 gallons water per hour. My mill and power are 700 feet distant. Can I run the pump by transmitting power by an endless wire rope? If so, about what power would be consumed, and what size wire rope (charcoal iron) would you advise? A. To raise this quantity of water requires but ½ to ¾ of 1 horse power. You can easily transmit this power by a wire rope; a diameter of ¾ inch or ½ inch rope running 1,200 feet per minute on a pulley 5 to 8 feet diameter will be ample to transmit the power.

(27) J. H. B. writes: I am putting up a great many engines ranging from 7 to 20 horse power, having a good deal of trouble with them. I cannot raise a working pressure of steam from 2 to 4 hours. Draught is poor. After getting it up, it cannot be kept up. Boiler, locomotive style, 30 to 40 two inch tubes, 6 to 7 feet in length. What is the best remedy for them? A larger smoke stack and longer one? Smoke stack is only 8 inches diameter, 12 feet long. A. You do not give the surface of grate. However, your smoke chimney is quite too small; it should be at least 16 inches diameter, and 18 or 20 feet high. You have also too little area through the tubes to get an active draught.

(28) R. J. H. writes I make for my own use nitrous oxide gas. I wish to compress it in an iron cylinder, say 100 gallons. Can you tell me what amount of pressure and degree of cold is required to liquefy it? A. Condensed to $\frac{1}{50}$ of its ordinary volume it liquefies at 0°; a pressure of 30 atmospheres (441 lb. per sq. in. absolute) is necessary. It boils at — 87 9° and solidifies at —115° to —140°—767·3 mm. pressure.

(29) A. D. O. asks: 1. Where can I obtain hydroquinone, mentioned on page 89 of the issue for Aug. 11? A. Hydroquinone can be obtained from dealers in pure chemicals in New York or through wholesale drug houses. 2. What is its cost? A. Its value varies from $1.50 to $2. 3. Please give the formula for using with gelatine bromide plates. A. As its use is not general as yet, no definite formula can be given other than to follow the recommendation of the SCIENTIFIC AMERICAN, to use it in the proportion of 1 to 2 of pyro.

(30) M. B. S.—Burning fluid used in the jet lamps is made with 95 per cent alcohol, 6 quarts; spirits turpentine, 1 quart.

(31) W. McC. asks: Will you please inform us what the characteristic (or designation) of "a ¼ bend" is, and the deflection—angle—of the same? A. One-quarter bend in the cast iron pipe trade is a bend of 90°, or a right angle. This is called in the wrought iron pipe trade an elbow. A bend in the wrought iron trade is a piece of pipe bent to a right angle.

(32) E. N. writes: If stagnant water containing glucose, refuse, or poisonous material freezes, does the ice contain any of the poison, and would it be safe to use? Does ice contain all the constituents (dissolved gases, air, etc.) of the water from which the ice was produced? A. Water in freezing separates to a certain extent from various salts, acids, and other chemicals in solution, as well as from air and gases to a degree. Gums, starch, and gelatinous substances in solution are more or less frozen with the water. Any granular or muddy substance held in suspension in freezing water is also held in the ice in too large a quantity to render it fit for drinking purposes. Ice from stagnant ponds, especially those containing glucose or starch refuse, is unfit to be used in refrigerators.

(33) M. G. B. writes: I have tried casting brass and have not succeeded. In pouring the melted brass in the mould, found it did not run properly; all full of holes. I would like to know if there is any special way of making mould so as to insure the brass running properly? It seemed to sputter too much. Is there any special degree to which the brass should be heated? Would you kindly tell me the yearly subscription price of *Engineering*? A. Probably your sand was too wet. If you have never seen the operations of a foundry, you may have to make a number of trials before you succeed in making a good solid casting, for sometimes experienced moulders make this mistake. We recommend you to obtain the proper sand (which should be a fine loam) from some foundry. By feeling of the sand that is used by moulders you can judge about how moist it should be for moulding. As a general rule, it should be very dry to allow the pattern to be drawn without crumbling the sand. The mould should also be well ventilated by scratching at the parting and also pricking the cope with a sharp wire. Do not heat the metal hotter than will run freely. The subscription to *Engineering*, postage prepaid to America, £1 16s., or about $9 a year.

(34) G. H. M. asks: Can a magneto bell machine, such as is used on a telephone line, be used to electroplate with, or could two of them be combined; and if so, how can they best be used—single or combined? should the bell magnets be removed? A. The current generated by a magneto such as is used in connection with telephones is alternating, and therefore not adapted to plating. A commutator might be applied so as to send the current away in one direction, but even then the machine would not answer, as it yields a current of great intensity. The remedy for this would be to wind the armature with coarse wire, say No. 22. The machine is too small for practical use.

(35) C. E. C. asks: Is there any difference between a sq. ft. or a ft. sq. (or 1 sq. ft., 1 ft. sq.)? If so, why? If none, prove. A. There is no difference between 1 ft. sq. and 1 ft, sq. Above one, however, there is a difference. Thus, 2 ft. sq. is in area twice as large as 2 sq. ft. Two sq. ft. is a square with sides 2 ft. in length, while 2 sq. ft. would be a rectangle, 2 ft. long and 1 ft high. Ten sq. ft. signifies an area containing ten squares of a foot each, while ten ft. sq. is a square having each of its sides ten feet in length.

(36) H. E. D. asks: 1. Whether an ordinary spark from a Ruhmkorff coil will explode hydrocarbon vapor mixed with air, or no? A. The spark from an induction coil will explode gas. The calorific spark is the most effective. 2. Please state the product of such explosion. Have been experimenting with it for a motor. I fear the hydrogen unites with oxygen of the air, reducing the elasticity too much. A. The products are principally carbonic acid and water. 3. In making a Ruhmkorff coil how many cells of Grove or other good battery will be required to make sparks sufficient to explode gas in a gas engine with coil? A. One cell would answer, but two would be better.

(37) J. W. asks: What material is the best at its cost as a preservative for pine shingled roofs? A. Dip, if possible, otherwise coat the shingles with linseed oil or crude petroleum. Sodium silicate, or water glass in combination with paint is rapidly coming into general use as a desirable substance for rendering articles fireproof.

(38) F. R. S. writes: Will you please inform me of the best method of waterproofing and making perfectly smooth, with the least weight, canvas on canvas canoes? A. Linseed oil is often used. Aluminum acetate is an excellent agent for waterproofing. See SCIENTIFIC AMERICAN SUPPLEMENT, No. 317, for seven methods for waterproofing.

(39) J. M. B. asks for a good glue for pasting cigarettes together, which will not stain the paper. A. Use either gum arabic or dextrine, sometimes called British gum.

(40) W. C. asks for process whereby a print of any kind may be taken from paper on to a piece of window glass within a given time of 10 or 15 minutes. A. The print is first coated with Grecian varnish or balsam of fir, then attached to the glass, and the surplus paper removed by rubbing with a wet rag or with the moistened fingers.

(41) A. S. S. asks if there is anything he could put on a goat skin robe to take away the disagreeable smell which is peculiar to that animal? A. Hold the skin over a fire of red cedar boughs, and sprinkle with chloride of lime; or wrap the skin in green hemlock boughs, when they are to be had, and in 24 hours it will be deodorized.

(42) W. H. R.—The following compound is claimed to render wood incombustible without affecting its natural color:

Zinc sulphate	55 pounds.
American potash	22 "
American alum	44 "
Manganese dioxide	22 "
Sulphuric acid, 60°	22 "
Water	55 "

The solid ingredients are first placed in an iron vessel containing the water at a temperature of 55° C., and when they are dissolved, the sulphuric acid is added in small quantities at a time, until the whole is saturated. The wood is then laid, with half inch space between each space, on iron gratings in a suitable apparatus, into which the mixture is pumped until all the spaces are filled. Heat is applied, and the wood is boiled in the mixture for about three hours, when it is taken out and dried for use in the open air.

(43) A. F. writes: I have been using the following composition as a dip for matches (sulphur): glue, 3; white lead, 2; phosphorus, 1½; bolomy, ½. But I find it will not stand damp weather; the head becomes soft. What is the trouble? A. After the matches have been dipped in paraffine and in sulphur, either of the following mixtures may be used:

1. Phosphorus	4 parts.
Niter	16 "
Red lead	3 "
Strong lead	6 "
2. Phosphorus	9 parts.
Niter	14 "
Manganese dioxide	14 "
Gum or glue	16 "

Melt the glue at 212° F., gradually add the phosphorus, which must be well stirred into the liquid; then add the niter and coloring matter. Keep the paste at a regular temperature of 97° F., by means of hot water under the marble or cast iron slab on which it is spread, while the matches are being dipped. When glue is used, there is less tendency to injury by the dampness.

(44) C. H. T. asks for an indelible writing ink that cannot be readily washed out. One that flows freely and is suitable for ordinary writing and bookkeeping. A. Triturate 1·75 grammes aniline black with 60 drops strong hydrochloric acid and 42 grammes strong alcohol. The mixture is diluted with a hot solution of 2·5 grammes gum arabic in 170 grammes water. This ink does not attack steel pens, and is destroyed neither by minerals, acids, nor caustic alkalies.

(45) A. E. D. asks for a suitable device for holding and dropping strong acids, that will drop the acid quite slowly, say at the rate of six to ten drops per hour. A. This can readily be accomplished by the use of a glass tube of proper length (to suit your purpose) with its end drawn out to fine point, or else by means of a funnel plugged with asbestos, yet with sufficient room to allow the dropping in accordance with your wishes.

(46) M. B. asks: the composition of the "gelatine printing or copying pad," and also that of the blue aniline ink which is used for writing the original of the article to be copied. A. One pound of gelatine is soaked in water until it becomes flaccid, after which it is melted in a water bath with 6 pounds ordinary glycerine, the heat being maintained for several hours so as to drive off excess of water. The mixture is then passed into zinc trays one-half inch deep and allowed to set. Another composition is:

Water	130 parts.
Barium sulphate	75 "
Gelatine	30 "
Sugar	30 "
Glycerine	180 "

The ink is made by dissolving 1 part of aniline violet (blue shade) in a mixture of 7 parts water and 1 of glycerine.

(47) W. I. asks how to prepare rubber cement. A. Rubber may be dissolved in carbon disulphide, benzine, or chloroform, or perhaps best of all in a mixture of methylated ether and petroleum spirit. See SCIENTIFIC AMERICAN SUPPLEMENT, 158.

(48) W. H. M.—On page 2510 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 158, will be found a number of recipes for cements, several of which will answer the purpose you desire.

(49) A. G. W. asks: 1. At what time are the scales found on the crown sheet of a horizontal boiler formed there? A. More or less from the time the boiler is put in use. The rapidity of the formation depends upon the character of the water and rapidity of evaporation and pressure. 2. Are these scales collected there as they are formed in the boiler or do they collect there at the time the boiler is being blowed off? A. During the operation of the boiler. 3. What is the cause of always finding them on the crown sheet when the man plates are taken out? A. They adhere to the heating surface, and blowing off does not remove them as it does where they do not adhere.

(50) J. F. G. asks: 1. What size boiler will it require for an engine 1 inch bore, 2¼ inches stroke? A. Should have about 3 feet heating surface. 2. What thickness of sheet? A. If not more than 10 or 12 inches diameter, three thirty-seconds of an inch thick will be sufficient if the joint is properly riveted. Do not rely upon brazing.

(51) H. L. B. asks if there is any instrument that will detect the presence of gold or silver coin four feet underground by passing over the surface with the instrument. A. There is no such instrument or contrivance.

(52) E. M. asks why a pump in perfect order will not drive water through a heater ten feet long, with eight turns of pipe, to the boiler. It will work well for a while, and then all at once it will run away, whereas it will throw water 15 feet above without any trouble. A. We do not know all the facts. Listen along the suction pipe; you may hear air drawing in. Examine the valves and see if they are free and not liable to stick when up.

(53) J. G. asks which is the highest church tower in America, and what is the height. A. Trinity Church, New York; height, 286 feet. The new cathedral, New York, was intended to be the highest, 325 feet, but is not yet finished.

(54) J. H. P. asks.—There is no way of making artificial marble by breaking up a cement that will hold a polish or stand the weather. You cannot expect to split fossil limestone into the shapes that you require. You must saw it. In this way it will slab the same as marble. 2. 270 cubic feet of new mown hay will weigh a ton; 216 to 243 cubic feet of old hay in stacks will weigh a ton.

(55) G. Brothers, ask: What is the best method of bleaching a mixture of fish oil and tallow in order to give it a fine yellow color? What is the best treatise on the subject? A. The simplest method of bleaching oils in a small way is as follows: For ten ounces of the oil take sixteen grains of potassium permanganate and dissolve in 1½ ounces water. Warm the oil to about 100° or 120° F., mix it with the permanganate solution, and shake the whole violently for some minutes. Let the mixture stand a few hours in a warm place, draw off the water, and finally filter the oils. There is no satisfactory work on the subject; it is entirely fragmentary and can only be obtained by consulting periodicals such as the SCIENTIFIC AMERICAN, SCIENTIFIC AMERICAN SUPPLEMENT, *Oil, Paint and Drug Reporter*, and others. Spons' Encyclopædia of the Industrial Arts contains a description of the various fish oils, but it is only in a general way that the subject is discussed.

(56) F. S. R. asks to what extent copper ferrules are used on the ends of locomotive, marine, stationary, and portable boiler tubes? To what extent have they been discarded on coal burning boilers? Has it been found that the use of coal has a more injurious effect on them than wood? A. Copper ferrules are largely used in locomotive boilers, some in both ends and many in only the fire box end. We do not know of any being used in stationary and marine boilers. Coal is more destructive to ferrules than wood. But that is not the reason for not using them in stationary boilers. It is the vibration of a locomotive that seems to loosen the tubes without the ferrule. The present system of expanding the tubes in stationary boilers is as nearly perfect as possible, and requires no ferrules.

(57) P. M. asks what is the best battery for electrotyping small objects about 2 inches square? I want to plate them about an eighth of an inch thick. Also the cost of the battery? A. Use three or four cells of gravity battery connected for quantity. Cost, $80 to $90 per cell.

© 1883 SCIENTIFIC AMERICAN, INC

(58) J B. C. writes: Can you tell me through the SCIENTIFIC AMERICAN: 1. I wish to use a liquid electrical conductor that shall be better than acidulated water and not as good as mercury. A. We know of no solution that will meet your wants. 2. Also a solid conductor that shall have much more resistance than carbon. A. Try charcoal or a mixture of charcoal and clay. 3. How can gold be given different colors, as in the letters of a monogram? A. This is done on cheap jewelry by means of thin lacquers colored with the anilines. The finer grades of work are made from pieces of gold of different colors soldered together. 4. How is silver oxidized, as in jewelry? A. Silver may be oxidized by dipping it in a solution of sulphate of potash.

(59) A. H. writes: If a train of cars traveling east at the velocity of a cannon ball should have on board a loaded cannon the mouth of which is pointed west, about how far would the ball in the cannon travel west if the cannon be discharged? A. The ball would fall to the ground at the point of firing under the conditions you mention.

(60) D. F. D. asks: 1. What kind of cement or preparation will cause lead to firmly adhere to a smooth iron surface? A. For joining metallic surfaces where soldering is inconvenient, recourse may be had to a composition formed in the following way: Pure and finely divided copper, such as that obtained by the reduction of copper sulphate with zinc clippings, 20 to 36 parts, according to the degree of hardness desired in the cement, dissolved in a sufficient quantity of sulphuric acid to make a thick paste; with this is incorporated, by trituration in a mortar, mercury, 70 parts. The mass is soft, but hardens at the end of some hours. For use it is heated to 100° C. and powdered in an iron mortar to 150° C. It adheres strongly on drying, and is harder in proportion as it contains more copper. 2. In what way can a cement be prepared, say, thirty minutes, sufficiently hard to be used as a mould for metal. A. A cement which may be used to unite all metals consists simply of a mixture of commercial glycerine and finely powdered litharge. By mixing glycerine and litharge a paste is obtained which will harden in from ten to thirty minutes, according to the amount of litharge used. We would recommend you to try the last receipt for forming moulds, described in second question.

(61) W. H. L.—The size for preparing wood work for gilding is as follows: To half a pound parchment shavings or cuttings of white leather, add 3 quarts water; boil it in a proper vessel till reduced to nearly half the quantity; then take it off the fire and strain it through a sieve. Be careful in the boiling to keep it well stirred, and do not let it burn.

(62) M. M. B. asks how to redye seal skins. A. All of the sealskins sold in this market are prepared and cured in London, where the process is kept very secret, and no knowledge can be obtained on the subject. Some information is given on page 5510 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 345, under head of "How Seal Skins are Dressed."

(63) J. A. C. asks: Which would be the best way to raise water from a drain mouth where a common outlet is not to be had? Would an Archimedean screw have any special advantage over a pump in a lift of 4 or 5 feet? Would a centrifugal pump be better than a common lift pump? Power to be a windmill. A. The best is the most simple and common lift pump (attached to wind mill). You can make one of wood or obtain one through the hardware trade from Chicago.

(64) A. N. Works asks how they can galvanize small castings without much cost. A. First dip your castings in a pickle of equal portions of sulphuric acid and water, and finally immerse in a bath of equal portions of tin and lead. We recommend you to read the article on "The Galvanizing Process," page 2798 of SCIENTIFIC AMERICAN SUPPLEMENT, No. 176.

MINERALS, ETC.—Specimens have been received from the following correspondents, and examined, with the results stated:

W. E. L.—Unfortunately in unpacking the specimens Nos. 1 and 2 became mixed. No. 3 is a black shale containing pyrite. No. 4 is a decomposed silicate, which is more or less weathered. None of the specimens sent, in our opinion, are of any value as far as their metallic constituents are concerned.—D. A. O.—The specimen is undoubtedly a fire clay, but its value can only be determined by chemical analysis. This would give the percentage of the worthless constituents. The expense would be $25.00.

Business and Personal.

The Charge for Insertion under this head is One Dollar a line for each insertion; about eight words to a line. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

The "Rockwood" Instantaneous Photographic Dry Plates are the best for amateurs and scientists. Send for circular and instructions, No. 17 Union Square.

Walrus Leather, Nickel Anodes, Salts, and all Platers' Supplies, Greene, Tweed & Co., New York.

Notice to Hydraulic Engineers.—Natural pressure waterworks needed at St. Ignace, Michigan. Correspondence solicited from practical men. Address B. E. Cubley, Secretary.

For Sale.—Five patents entire, Nos. 235,844, 244,414, 254,251, 247,286, 238,545. Paper Pulp Engine. Pay as speciality. J. R. Abbe, Manchester, N. H.

Steam Pipe and Boiler Covering, Roofing Paints, Prepared Roofing, and general line of Asbestos materials. Phil Carey & Co., 127 Central Avenue, Cincinnati, O.

For Sale.—Valuable patent in small shelf-hardware. Address Patentee, Box No. 986, Leadville, Col.

Pocket Manual—Inquire Within, No. 2, just ready. Prepared by ten specialists. Sells on sight to all. $25 worth of valuable and real information for 50c. 224 pages; cloth bound. Agents' harvest. Particulars free. R. L. Watkins, Drawer 517, Prospect, Ohio.

Philosophical and Chemical Apparatus and Materials. Send for catalogue. Queen & Co., Philadelphia.

Dies, Patterns, etc., Chas. A. Bailey, Middletown, Ct.

Blake's Patent Belt Studs are the strongest, cheapest, and most durable fastening for belts. Greene, Tweed & Co., New York.

MASTERY.—An illustrated weekly devoted to Home Handicrafts, Household Affairs, Rural Occupations, Industrial Arts, Amateur Mechanics, Experimental Science; aiding young people in Self-culture of the Hand and Eye, and Self-help for Profit. Liberal offer to canvassers. Terms—$3.00 per year, in advance; $1.00 for 15 weeks, on trial; 7 cents a copy. Ask newsdealers, or address 842 Broadway, New York. MASTERY.

Straight Line Engine Co., Syracuse, N. Y. Best in design, materials, workmanship, governing; no packing.

Back numbers, volumes, and sets SCIENTIFIC AMERICAN supplied by A. S. Clark, 34 Park Row, New York.

For Freight and Passenger Elevators send to L. S. Graves & Son, Rochester, N. Y.

Brush Electric Arc Lights and Storage Batteries. Twenty thousand Arc Lights already sold. Our largest machine gives 80 Arc Lights with 45 horse power. Our Storage Battery is the only practical one in the market. Brush Electric Co., Cleveland, O.

Best Squaring Shears, Tinners', and Canners' Tools at Niagara Stamping and Tool Company, Buffalo, N. Y.

Lathes 14 in. swing, with and without back gears and screw. J. Birkenhead, Mansfield, Mass.

The Best.—The Dueber Watch Case.

If an invention has not been patented in the United States for more than one year, it may still be patented in Canada. Cost for Canadian patent, $40. Various other foreign patents may also be obtained. For instructions address Munn & Co., SCIENTIFIC AMERICAN Patent Agency, 261 Broadway, New York.

Guild & Garrison's Steam Pump Works, Brooklyn, N. Y. Steam Pumping Machinery of every description. Send for catalogue.

Nickel Plating.—Sole manufacturers cast nickel anodes, pure nickel salts, polishing compositions, etc. Complete outfit for plating, etc. Hanson & Van Winkle, Newark, N. J., and 92 and 94 Liberty St., New York.

Lists 29, 30 & 31, describing 4,000 new and 2d-hand Machines, ready for distribution. State just what machines wanted. Forsaith & Co., Manchester, N. H., & N. Y. city.

Spy Glasses, Telescopes, Opera Glasses, Field Glasses. Send for catalogue. Queen & Co., Philadelphia.

For Power & Economy, Alcott's Turbine, Mt. Holly, N. J.

"Abbe" Bolt Forging Machines and "Palmer" Power Hammers a specialty. Forsaith & Co., Manchester, N.H.

Railway and Machine Shop Equipment.
Send for Monthly Machinery List
to the George Place Machinery Company,
121 Chambers and 103 Reade Streets, New York.

"How to Keep Boilers Clean." Book sent *free* by James F. Hotchkiss, 84 John St., New York.

Wanted.—Patented articles or machinery to make and introduce. Gaynor & Fitzgerald, New Haven, Conn.

Water purified for all purposes, from household supplies to those of largest cities, by the improved filters manufactured by the Newark Filtering Co., 177 Commerce St., Newark, N. J.

Improved Skinner Portable Engines. Erie, Pa.

Catalogues free.—Scientific Books, 100 pages; Electrical Books, 14 pages. E. & F. N. Spon, 35 Murray St., N. Y.

Latest Improved Diamond Drills. Send for circular to M. C. Bullock Mfg. Co., 80 to 88 Market St., Chicago, Ill.

Ice Making Machines and Machines for Cooling Breweries, etc. Pictet Artificial Ice Co. (Limited), 142 Greenwich Street. P. O. Box 3083, New York city.

Presses & Dies. Ferracute Mach. Co., Bridgeton, N. J.

Machinery for Light Manufacturing, on hand and built to order. E. E. Garvin & Co., 139 Center St., N. Y.

Split Pulleys at low prices, and of same strength and appearance as Whole Pulleys. Yocom & Son's Shafting Works, Drinker St., Philadelphia, Pa.

Supplement Catalogue.—Persons in pursuit of information on any special engineering, mechanical, or scientific subject, can have catalogue of contents of the SCIENTIFIC AMERICAN SUPPLEMENT sent to them free. The SUPPLEMENT contains lengthy articles embracing the whole range of engineering, mechanics, and physical science. Address Munn & Co., Publishers, New York.

Fossil Meal Composition, the leading non-conducting covering for boilers, pipes, etc. See adv., p. 301.

Drop Forgings. Billings & Spencer Co. See adv., p. 189

For Mill Mach'y & Mill Furnishing, see illus. adv. p. 268.

Mineral Lands Prospected, Artesian Wells Bored, by Pa. Diamond Drill Co. Box 423, Pottsville, Pa. See p. 270.

American Fruit Drier. Free Pamphlet. See ad., p. 285.

Curtis' Expansion Trap. See illustration on p. 118.

Brass & Copper in sheets, wire & blanks. See ad. p. 284.

The Chester Steel Castings Co., office 407 Library St., Philadelphia, Pa., can prove by 20,000 Crank Shafts and 15,000 Gear Wheels, now in use, the superiority of their Castings over all others. Circular and price list free.

Diamond Tools. J. Dickinson, 64 Nassau St., N. Y.

The Improved Hydraulic Jacks, Punches, and Tube Expanders. R. Dudgeon, 24 Columbia St., New York.

Friction Clutch Pulleys. D. Frisbie & Co., Phila. Pa.

Tight and Slack Barrel Machinery a specialty. John Greenwood & Co., Rochester, N. Y. See illus. adv. p. 285.

Our goods speak for themselves, and a trial will convince the most skeptical of their superiority over all others. Lehigh Valley Emery Wheel Co., Lehighton, Pa.

Special Students in Technical Chemistry, Analysis, and Assaying. Apply to Prof. Leeds, laboratory of the Stevens Institute of Technology, Hoboken, N. J.

Pays well on small investment.—Stereopticons, Magic Lanterns, and Views illustrating every subject for public exhibitions. Lanterns for colleges, Sunday-schools, and home amusement. 116 page illustrated catalogue free. McAllister, Manufacturing Optician, 49 Nassau St., N. Y.

Sewing Machines and Gun Machinery in Variety. The Pratt & Whitney Co., Hartford, Conn.

C. B. Rogers & Co., Norwich, Conn., Wood Working Machinery of every kind. See adv., page 285.

Lightning Screw Plates, Labor-saving Tools, p. 284.

Aneroid Barometers, Mercurial Barometers, Thermometers, Anemometers, Hydrometers, Hygrometers. Send for catalogue. Queen & Co., Philadelphia.

INDEX OF INVENTIONS

For which Letters Patent of the United States were Granted

October 23, 1883.

AND EACH BEARING THAT DATE.

[See note at end of list about copies of these patents.]

Adjustable elevator, G. Milliken ... 287,042
Aging liquors, process of and apparatus for, H. Glass ... 287,272
Air compressor, G. R. Cullingworth ... 287,104
Air compressor, hydraulic, W. A. Babcock ... 287,358
Air compressors, inlet valve for, G. R. Cullingworth ... 287,004
Air compressors, inlet valve for, Cullingworth & Potter ... 287,007
Air compressors, outlet valve for, G. R. Cullingworth ... 287,005
Air compressors, pressure regulator for, Cullingworth & Potter ... 287,105
Air compressors, safety governor for, G. R. Cullingworth ... 287,101
Air compressors, water pump attachment for, C. W. Potter ... 287,325
Alcohol, process of and apparatus for purifying, J. Bendix ... 287,089
Ammonia from its solution in the manufacture of ice, etc., process of and apparatus for separating, G. O. Rinman ... 287,056
Animal shears, Gleason & Holt ... 287,018
Animal trap, J. H. & T. D. Morris ... 287,387
Automatic switch and cut-out, C. G. Perkins ... 287,351
Axle, car, A. Walton ... 287,202
Bag or satchel lock, R. Flocke ... 287,114
Baling press, P. K. Dederick ... 287,107
Band cutter, J. Allen ... 287,212
Bankbook, depositor's, E. T. Moulton ... 287,045
Bearing, anti-friction, J. G. Avery ... 287,215
Bed bottom, spring, E. W. Grafton ... 287,120
Bed lounge, F. Rentschler ... 287,165
Bell, L. E. Clark ... 287,238
Bell gearing, A. H. Kennedy ... 287,297
Berths, counter balance for folding steps for, Castle & Skaats ... 286,998
Blankets, putting up, D. A. Swaney ... 287,394
Blast furnace, P. L. Weimer ... 287,204
Board. See Bosom board.
Boat knees, etc., joint for, J. W. Sanborn ... 287,057
Boiler furnaces, locomotive and other, J. A. Gano (r) ... 10,396
Bolting reels, apparatus for feeding flour to, E. L. Conklin ... 287,097
Book clasp, A. C. Hafely ... 287,123
Boot and shoe jack, P. D. Crull ... 287,100
Bosom board, A. P. Ryan ... 287,329
Bottle covering, S. Oakman ... 287,049
Bottle stopper, F. H. Lowerre ... 287,141
Bottle stopper fastener, J. T. Walker ... 287,350
Box. See Journal box.
Box fastener, T. H. Brown, Jr ... 287,093
Bran compressor, J. L. Kail ... 287,133
Brake. See Car brake. Wagon brake.
Brick, apparatus for tempering and preparing clay for making, W. W. Winn ... 287,074
Brush handle, S. B. Stanton ... 287,187
Buckle, F. Armstrong ... 287,051
Buckle, trace, D. T. Harbison ... 287,125
Bung extractor, Macher & Lins ... 287,305
Bustle, A. Kelley ... 287,029
Button setting instrument, Pratt & English ... 287,389
Cable grip, etc., endless, A. Haman ... 287,377
Caisson gate, G. F. Schild ... 287,178
Calculating machine, I. E. Tallman ... 287,192
Calendar, H. S. Hack ... 287,022
Calendar, H. H. Ham, Jr ... 287,281
Camel for lightening vessels, J. J. Peetz ... 287,156
Can. See Milk can. Oil can. Paint can.
Can testing machine, Norton & Hodgson ... 287,048
Cane, electric, A. & A. Roovers ... 287,170
Cane stripper and header, Coburn & Thompson ... 287,240
Car brake, E. Katzenmayer ... 287,293 to 287,295
Car brake, W. C. Travis ... 287,395
Car coupling, F. Attock ... 287,082
Car coupling, R. Bigney ... 286,992
Car coupling, C. Clarke ... 286,999
Car coupling, J. B. Draper ... 287,110
Car coupling, C. J. Fortson ... 287,270
Car coupling, E. N. Gifford ... 287,017
Car coupling, T. H. James ... 287,130
Car coupling, C. Luther ... 287,385
Car coupling, E. F. Walker ... 287,070
Car coupling and buffer, C. C. & C. Balderston ... 287,084
Carbon filaments, apparatus for treating, C. G. Perkins ... 287,318
Carpet fastener, Nickerson & Dufrane ... 287,388
Carriage spring, T. D. Lines ... 287,303
Carrier. See Cash and parcel carrier. Parcel carrier.
Cartridges, charge retainer and concentrator for, R. W. Morgan ... 287,151
Cash and parcel carrier, automatic, C. Grant, Jr ... 287,278
Chopper and cultivator, combined, E. A. Daniel ... 287,251
Chuck, planer, W. Porter ... 287,160
Clasp. See Book clasp. Garment supporter clasp.
Clasp, J. E. Bedford ... 286,991
Cleaner. See Cotton cleaner. Slate and window cleaner. Steam boiler cleaner.
Clock gravity escapement, D. Shive ... 287,181
Coal elevator and conveyer, R. B. Little ... 287,140
Coke oven, L. Semet ... 287,332
Coke oven door and frame therefor, Herron & Wray ... 287,285
Collar, W. Cohlman ... 287,241
Collar, A. C. Fellows ... 287,263
Colter, rolling landside, G. B. St. John ... 287,336
Compressing pulverized material, C. Hemje ... 287,123
Cooler. See Lard cooler.
Cork and screw nozzle, combined, E. Norton ... 287,046
Corn cutter, green, E. M. C. Anderson ... 287,080
Corn husker, T. P. Fletcher ... 287,269
Corn silker, green, C. P. Balle ... 287,083
Cotton cleaner and gin feeder, Z. F. Nance ... 287,153
Cover for chamber pails, etc., H. Stone ... 287,189
Creel for spooling and warping machines, G. L. Tarr ... 287,338
Crochet needle, J. H. Doolittle ... 287,109
Cultivator, J. G. Trump ... 287,196
Cultivator tooth, reversible, G. D. Rowell ... 287,172
Curtain loop or holder, S. A. Chapman ... 287,234
Cutter. See Band cutter. Corn cutter. Sewing machine thread cutter. Stalk cutter. Vegetable cutter. Weed cutter.
Cutting blanks, machine for, J. R. Williams ... 287,073
Dental plate, V. Van Vleck ... 287,199
Designs, representing and multiplying monumental and other, F. M. Nichols ... 287,310
Desk, office, C. H. Tyler ... 287,068
Detachable hook, H. E. Foster ... 287,115
Die press connecting rod, J. M. Seymour ... 287,333
Direct-acting compound engine, F. W. Jenkins ... 287,289
Disinfecting apparatus, J. S. Wood ... 287,208
Door hanger, S. M. Stevens ... 287,065
Door pull, sliding, T. Lyons ... 287,039
Doors, stay roller for sliding, W. M. Brinkerhoff ... 287,223
Drawer, furniture, T. W. Moore ... 287,386
Dress shield, I. B. Kleinert ... 287,298
Drilling machine, T. J. & F. T. Currier ... 287,366
Drilling machine, J. Richards ... 287,326
Drilling machine, E. J. Worcester ... 287,209
Drum for hot air furnaces, radiating, Miller & Mager ... 287,149
Electric conductor, F. Jacob ... 287,288
Electric currents, system of generating and distributing, C. J. Van Depoele ... 287,347
Electric cut-out, automatic, C. G. Perkins ... 287,320
Electric lighting system, J. A. McCoy ... 287,040
Electric machine regulator, dynamo, C. J. Van Depoele ... 287,343
Electric machines, safety-switch for dynamo, C. J. Van Depoele ... 287,345
Electric switch and cut-out, C. G. Perkins ... 287,322
Electric switch board and signaling apparatus, T. W. Lane ... 287,300
Electric transmitter, S. D. Field ... 287,267
Electric wires, gutter, curbstone, and sidewalk conduit for, E. Clark ... 287,237
Elevating devices, friction brake for, J. A. Evarts ... 287,262
Elevator. See Adjustable elevator. Coal elevator. Hod elevator. Pneumatic elevator.
Elevator, W. Dutemple ... 287,012
Elevator bucket, R. B. Little ... 287,139
Elevator safety appliance, J. Hodges ... 287,287
Engine. See Direct-acting compound engine. Rotary engine.
Engine reversing gear, Hatch & Riesenberg ... 287,023
Eraser, slate and blackboard, M. E. Ingram ... 287,381
Ether, apparatus for administering, S. Cooper ... 287,098
Evaporater, W. A. Herring ... 287,026
Extracting juices from animal and vegetable substances, apparatus for, Desgoffe & Di Giorgio ... 287,010
Extractor. See Bung extractor. Stump extractor.
Faucet, W. A. Babcock ... 287,357
Fence, barbed wire, J. E. Evans ... 287,261
Fence, wire, J. C. Ford ... 287,372
Fence, wire, J. Stubbe ... 287,337
Fence wire, barbed, C. B. Brainard ... 287,091
Fence wire, barbed, H. B. Scutt ... 287,059
Fence wire, ornamental, W. R. Reynolds ... 287,391
Fences, erecting wire, J. & W. M. Brinkerhoff ... 287,222
Fences, implement for wiring hedge, W. Young ... 287,077
Fiber cutting machine, E. W. Ross ... 287,392
File blanks, machine for stripping, A. Weed ... 287,072
Firearm, magazine, P. Boch ... 287,090
Fire escape, I. Buckman ... 287,228
Fire escape, W. S. Cassedy ... 287,233
Fire escape, M. J. Cook *et al* ... 287,365
Fire escape, D. P. Edgar ... 287,257
Fire escape, C. J. Lung ... 287,142
Fire escape, L. Sawtell ... 287,058
Fire extinguisher, automatic, Walworth & Hall ... 287,071
Flour dressing machine, M. Crawford ... 287,250
Flower pot holder and shield, W. A. Birch ... 286,993
Flushing tank, automatic, M. Sexton ... 287,179
Folding table, M. Maples ... 287,306
Foot warmer, D. Shirley ... 287,061
Forge, blacksmith's, W. Shaw ... 287,180
Fruit bleacher, A. Brockway ... 287,224
Furnace. See Blast furnace.
Gaiter, congress, N. R. Packard, 2d ... 287,312
Game apparatus, T. H. Ward ... 287,352
Garment supporter, B. J. Greely ... 287,020
Garment supporter clasp, S. Wales ... 287,349
Gas lights, lighting and extinguishing, D. C. Baughman ... 287,218
Gas, manufacturing illuminating, T. G. Springer ... 287,185
Gas, process of and apparatus for manufacturing, Granger & Collins, Jr ... 287,277
Gate. See Caisson gate. Railway gate.
Gate, W. N. Bowers ... 287,361
Gate, I. E. Smith ... 287,184
Generator. See Steam generator.
Glass caster stand and mould, D. C. Ripley (r) ... 10,397
Glass pot, T. A. Zellers ... 287,355
Gloves, shoes, etc., fastening for, G. A. Lange ... 287,135
Grain separator and cleaner, H. Parish ... 287,154
Grinding and polishing wheel, J. H. Madden ... 287,144
Grooving boards for boxes, machine for, G. Wilson ... 287,207
Guard. See Life guard.
Gun, magazine, J. H. Bullard ... 287,229
Hame, P. Hayden ... 287,282
Hame, R. D. Whitzel ... 287,398
Handle. See Brush handle.
Hanger. See Door hanger.
Harrow, A. A. Werts ... 287,353
Hat and other head wear, R. G. Salomon ... 287,176
Hatchway protector for elevators, R. T. Bean ... 287,219
Headlight signal, locomotive, C. Anderson ... 287,079
Heating fire-back and frame, two-room, J. H. Burnam ... 287,280
Hides, machine for stretching and drying, L. Dederick ... 287,009
Hod elevator, endless, O. N. Eaton ... 287,013
Hoe, H. & L. Iwan ... 287,027
Holder. See Flower pot holder. Pamphlet holder. Pencil holder. Rein holder.
Hook. See Detachable hook. Snap hook.
Horse detacher, E. R. Herring ... 287,284
Horse power, J. H. Elward ... 287,259
Horse power speed regulator, J. A. Rouse ... 287,327
Horses, overshoe for, B. Greenaway ... 287,280
Horseshoe, T. Hend ... 287,024
Horseshoe nail blanks, finishing, W. W. Miner ... 287,150
Horseshoe nail blanks, machine for finishing, J. B. Wills ... 287,206
Hose jumper, W. B. Thomas ... 287,341
Hub attaching device, J. W. Nunn ... 287,311
Incandescents, apparatus for carbonizing, C. G. Perkins ... 287,315, 287,316
Incandescents, apparatus for treating, C. G. Perkins ... 287,317
Indicator. See Interest indicator. Station indicator.
Insulating covering for telegraph wires, metallic, E. Clark ... 287,236
Insulating material, C. J. Van Depoele ... 287,346
Insulator, electric wire, J. F. Martin ... 287,146
Interest indicator, H. E. Jenne ... 287,280
Intestines, machine for cleaning, F. E. Davis ... 287,253
Iron. See Soldering iron.
Iron, apparatus for treating molten, R. H. Gordon ... 287,273
Iron from blast furnaces, analyzing pig, S. A. Ford (r) ... 10,395
Iron, process of and plant for producing cast, J. Reese ... 287,054

© 1883 SCIENTIFIC AMERICAN, INC

Jack. See Boot and shoe jack. Lifting jack. Wagon jack.
Joint. See Lightning rod joint. Railway rail joint.
Journal bearing, E. R. Ware ... 287,293
Journal box, G. R. Cullingworth ... 287,006
Knitting machine needle, L. E. Salisbury ... 287,175
Lamp and holder, electric incandescent, C. G. Perkins ... 287,314
Lamp and switch, incandescent electric, C. G. Perkins ... 287,313
Lamp, electric arc, J. B. Tibbits ... 287,067
Lamp, electric incandescent, C. G. Perkins ... 287,319
Lamps, carbon holder for incandescent, C. G. Perkins ... 287,323
Lamps, clockwork for mechanical, T. Silver ... 287,334
Lamps, electrode for electric arc, C. J. Van Depoele ... 287,344
Lard cooler, O. G. Burnham ... 287,362
Level, L. Van Alstyne ... 287,342
Leveling rod, W. Gurley ... 287,021
Life guard and track clearer, R. B. Locke ... 287,036
Lifting jack, T. Thom ... 287,066
Lifting jack crank handle, J. M. Vance ... 287,198
Lighting rod joint, W. Hewitt ... 287,286
Link bending machine, J. Baird ... 287,359
Lock. See Bag or satchel lock. Nut lock. Seal lock.
Lubricator, C. W. Baldwin ... 287,085
Lumber, drying and seasoning, J. F. Walter, Jr. ... 287,351
Marker, land, L. Gairaud ... 287,118
Mask for baseball catchers, A. K. Schaap ... 287,331
Mask, wire, H. C. Lee ... 287,137
Meat cutting machine, W. G. Bell ... 287,360
Melons, apparatus for packing and transporting, W. Davis ... 287,106
Metal, removing surplus material from articles coated with melted, H. A. Young ... 287,076
Meter, R. Heinle ... 287,283
Milk can, Wilkie & Duggan ... 287,205
Mill. See Rolling mill.
Mining machine, coal, S. C. Lechner ... 287,032
Mordant for aniline black, A. N. Dubois ... 287,112
Motion, device for converting, R. G. Moody ... 287,307
Music paper for automatic musical instruments, machine for perforating, R. T. Smith ... 287,062
Nail plate feeder, J. H. Dunbar ... 287,368
Necktie and collar stay, J. G. Minnich, Jr ... 287,043
Necktie fastening, F. L. Garrigues ... 287,119
Nut lock, F. H. Cranford ... 287,008
Nut lock, B. G. Miller ... 287,041
Nut lock, A. Reese ... 287,390
Oil can, J. A. Campbell ... 287,232
Oils, decoloring vegetable, Bang & Sanguinetti ... 287,216
Oleaginous matter from animal and vegetable substances, extracting, J. D. Jones ... 287,382
Ore concentrator, C. C. Rueger ... 287,173
Ore concentrator, dry, J. G. Vollmer ... 287,396
Ore grinder and amalgamator, combined, P. Eddy ... 287,256
Ore separator and amalgamator, Tobey & Thayer ... 287,195
Ores for furnaces, preparing powdered or granulated, J. J. Fronheiser ... 287,117
Padlock, indicator, A. Jackson ... 287,028
Padlock, permutation, G. H. Newell ... 287,309
Paint can, E. Norton ... 287,047
Pamphlet holder, J. O. Poor ... 287,052
Parcel carrier, J. R. H. Hinton ... 287,129
Parcel transmitter for stores, D. M. Skinner ... 287,182
Paving and building blocks, machine for making, C. Diebold ... 287,011
Pen, fountain, J. H. Shields ... 287,060
Pencil holder, L. O. Hull ... 287,400
Phonograph, C. C. Reynolds ... 287,166
Picker. See Shoddy picker.
Picture hanger, S. B. Ellithorp ... 287,113
Pin, B. A. Ballou ... 287,086
Pipe wrench, J. L. Taylor ... 287,193
Plane, bench, J. Campbell (r) ... 10,394
Plane, joiner's, W. B. Fenn ... 287,371
Planing and sawing machine, T. J. Glousier ... 287,019
Planometer or measuring parallel ruler, A. Wachs ... 287,200
Planter and fertilizer distributer, hand seed, R. A. Johnson ... 287,132
Planter and fertilizer distributer, seed, C. Young ... 287,210
Planter and guano distributer, combined cotton, J. A. Elliott ... 287,014
Planter, corn, W. G. Gray ... 287,121
Planter, corn, Kroulik & Bilan ... 287,384
Planter, hand corn, M. Records ... 287,162
Pliers for cutting and capping fuse, etc., S. Poole ... 287,159
Plow, Luse & Bell ... 287,143
Plow, D. K. Miller ... 287,148
Plow, seeder, and cultivator, sulky, P. Lincoln ... 287,034
Pneumatic elevator, J. Lewis ... 287,033
Poke, animal, P. Swan ... 287,190
Portfolio, King & Goodwin ... 287,030
Pot. See Glass pot.
Power. See Horse power.
Press. See Baling press.
Printing machine, Kendall & Kruse ... 287,383
Printing presses, automatic cutting and feeding attachment for, C. E. Clement ... 287,239
Printing presses, sliding bearer for beds of, A. Campbell ... 286,997
Protector. See Hatchway protector.
Pulp from sugar cane, etc., producing, E. C. Le Bourgeois ... 287,302
Pulp strainer, H. Reinicke ... 287,164
Pump, J. W. Powers ... 287,053
Pump bucket, chain, O. E. Wadhams ... 287,348
Pump, double-acting steam, E. Davies ... 287,252
Pump regulator, steam, J. Wagner ... 287,069
Radiator attachment, steam, R. T. Crane ... 287,099
Radiator, steam and hot water, J. Haag ... 287,122
Railway fog signal, W. S. Phelps ... 287,157
Railway frog, A. H. Gorton *et al* ... 287,274
Railway gate, McNeely & Drake ... 287,147
Railway rail joint, C. M. Keefer ... 287,296
Railway signal, Peddle & Thornton ... 287,051
Railways, conduit for traction rope, A. Bonzano ... 287,220
Range boiler setting, J. H. Burnett ... 287,231
Razor strop and drawer, combined, H. B. Emerson ... 287,260
Recorder. See Time recorder.
Regulator. See Speed regulator.
Rein holder, Laney & Yost ... 287,031
Revolving wrench, S. A. Thomas ... 287,194
Ring. See Watch dust ring.
Rock drill support, G. R. Cullingworth ... 287,102
Rock drill tripod, G. R. Cullingworth ... 287,108
Rock drills, connecting rod for, C. A. Sterling ... 287,188
Rod. See Leveling rod.
Roller mill feed mechanism, G. V. Hecker ... 287,126
Rolling mill, continuous, F. H. Daniels ... 287,008
Rotary steam engine, L. D. Hooper ... 287,379
Rowing apparatus, boat, A. Beckers ... 287,088
Rowlock, J. Passeno ... 287,155
Sack turner, L. Arthur ... 287,214
Safe, fireproof, T. Brett ... 286,996
Salt evaporating pan, G. H. Smith ... 287,183
Sandpapering machine, J. R. Thomas *et al* ... 287,340
Sawmill dog, J. Moore ... 287,308
Saw swage, P. B. Charboneau ... 287,363
Saw table gauge, J. H. Hamlet ... 287,124
Sawing machine, circular, L. Gould ... 287,275
Scales, scoop balance attachment for weighing, A. Leas ... 287,136
Scouring wheat, etc., machine for, J. T. Ewan ... 287,370
Scraper, boot, M. A. Collins ... 287,242
Seal lock, V. A. Krepps ... 287,299
Seal trap for lavatories, bath tubs, etc., mercury, A. Edwards ... 287,369
Seed bar tooth, G. D. Rowell ... 287,171
Seeding machine, J. M. Lindsey ... 287,035
Separator. See Grain separator. Ore separator.
Settee, cot, and tent, convertible, E. S. Amrock ... 287,078
Sewed, device for holding material to be, E. J. Moore ... 287,044
Sewing machine, Bailey & Hurd ... 286,988
Sewing machine, E. T. Thomas ... 287,339
Sewing machine attachment, Bonney & Lamoreux ... 286,994
Sewing machine, buttonhole, C. M. Banks ... 287,217
Sewing machine buttonhole attachment, C. M. Banks ... 286,989
Sewing machine for sewing carpet, etc., G. Gowing ... 287,276
Sewing machine ruffling attachment, J. S. Sackett ... 287,174
Sewing machine thread cutter, J. Valero ... 287,197
Sewing strands of braid, machine for, M. H. Ryder ... 287,393
Shears. See Animal shears. Slotting shears.
Sheet metal vessel, W. M. Conway ... 287,243
Shoddy picker, C. S. Dodge ... 287,108
Shoe vamps, apparatus for marking, M. J. Ferren ... 287,264
Shovel and ash sifter, combined, E. Frary ... 287,116
Shutter fastener, S. Poole ... 287,158
Sieve, coal, J. G. W. Putnam ... 287,161
Signal. See Headlight signal. Railway fog signal.
Sink, G. F. Coomber ... 287,246
Skins, tawing, F. E. Dietsch ... 287,255
Slate and window cleaner, Deeds & Mack ... 287,254
Slotting shears, C. W. Crane ... 287,249
Snap hook, R. B. Whitzel ... 287,397
Soldering iron, electrical, C. T. Hughes ... 287,380
Sound transmitting apparatus, J. H. Rogers ... 287,169
Spacing instrument, J. O. Madison ... 287,145
Speed regulator, J. C. S. Labaw ... 287,134
Spindle and support or bearing therefor, J. R. Gray ... 287,279
Spring. See Carriage spring. Vehicle spring.
Springs, crank plate for bolster, J. Smith ... 287,335
Stalk cutter, J. J. Coyle ... 287,248
Stamp, hand, W. W. Sawyer ... 287,177
Staples, machine for forming, T. S. Bayles ... 287,087
Station indicator, W. W. Campbell ... 287,094
Steam boiler cleaner, Lowcock & Taylor ... 287,038
Steam generator, C. Ahrens ... 287,211
Steamer, cooking, J. M. Johnson ... 287,292
Steel, manufacture of, W. W. Chipman ... 287,235
Stopper. See Bottle stopper.
Stove, car, Fife & Pickenpaugh ... 287,268
Stovepipe and chimney attachment, J. M. Egnor ... 287,258
Street sweeping machine, A. Stackpole, Jr ... 287,186
Stump extractor, D. Cornelieus ... 287,002
Supporter. See Garment supporter.
Switch. See Automatic switch. Electric switch.
Table. See Folding table.
Tacking or nailing apparatus, hand, L. Goddu ... 287,375
Tank. See Flushing tank.
Telegraph and transmitter therefor, printing, S. D. Field ... 287,265
Telegraph, printing, S. D. Field ... 287,266
Telephone lines, mechanism for preventing induced currents in, Brennan & Rousseau ... 287,092
Telephone repeater, D. Drawbaugh ... 287,111
Telephone support, T. W. Lane ... 287,301
Telephonic system, G. L. Anders ... 287,356
Textile fabric and the like, manufacture of, H. da Costa Correa Leite ... 287,247
Therapeutic electric appliance, J. E. Carr ... 287,096
Thrasher and separator, pea, T. J. Porter ... 287,324
Thrashing machine, clover and grain, Lippy & Stocking ... 287,304
Tile hearth or vestibule floor, I. L. Frankem ... 287,373
Time controlling system, W. F. Gardner ... 287,015
Time recorder, watchman's, A. M. Johnson ... 287,291
Tongs and cutter, pipe, H. Herbert ... 287,378
Tongue, hinged, W. A. Rusler ... 287,328
Tooth crown, artificial, Weston & Starr ... 287,354
Torpedoes, manipulating and firing marine, T. M. Brasher ... 287,221
Toy horse and cart, F. W. Carpenter ... 287,095
Trap. See Seal trap.
Tripod or standard, Richardson & Manchester ... 287,168
Truck, car, T. J. Furbee ... 287,374
Trunk catch, Buckins & Taylor ... 287,226
Trunk fixture, Buckins & Taylor ... 287,227
Tug, hame, E. C. Lelie ... 287,138
Valve, safety, A. H. Jarecki ... 287,131
Valve, safety, G. W. Richardson ... 287,167
Vegetable cutter, C. L. Heisler ... 287,127
Vehicle sand band, W. Cole ... 287,364
Vehicle, side bar, Geibel & Price ... 287,016
Vehicle spring, A. J. Spalding ... 287,063
Vehicle, two-wheeled, N. B. Clinch ... 287,000
Vehicle wheel, M. I. Winters ... 287,075
Ventilator. See Window ventilator.
Vinegar generators, automatic feeder for, P. & J. Spielmann ... 287,064
Vise, J. O. Barrett ... 286,990
Vise, C. M. Boyce ... 286,995
Vise, P. A. Gladwin ... 287,271
Wagon brake, W. R. Long ... 287,037
Wagon jack, C. H. Swink ... 287,191
Wardrobe, M. A. Winter ... 287,399
Warping machine, W. S. Walcott ... 287,201
Watch dust ring, S. M. Morgan ... 287,152
Watch pendant, C. K. Colby ... 287,001
Water closet, W. P. Buchan ... 287,225
Water wheel, L. C. Ryan ... 287,330
Weather strip, P. Cool ... 287,245
Weed cutter, W. F. & H. C. Reeves ... 287,163
Wheel. See Grinding and polishing wheel. Vehicle wheel. Water wheel.
Whiffletree, J. Grems ... 287,376
Whisky, making, Allen & Bradley ... 287,213
Windlass, marine steam, J. F. Pankhurst ... 287,050
Window ventilator, J. G. Reinl ... 287,055
Wire stretcher, J. J. Cook ... 287,244
Wool oiling apparatus, F. Herboth ... 287,025
Wrench. See Pipe wrench. Revolving wrench.
Yeast, preparing, Delany & Jameson ... 287,367

DESIGNS.

Basque, lady's dress, J. Q. Reed ... 14,371
Carpet, A. Danby ... 14,354
Carpet, R. P. Hemming ... 14,357, 14,358
Carpet, H. Hunt ... 14,360
Carpet, W. McCallum ... 14,363
Carpet, D. G. Melville ... 14,361, 14,362
Carpet, A. Petzold ... 14,369
Cloak, child's, C. O'Hara ... 14,364
Cloak, girl's, C. O'Hara ... 14,367
Costume, child's, C. O'Hara ... 14,366
Costume, girl's, C. O'Hara ... 14,365, 14,368
Fringe, C. Cresson ... 14,353
Glove, R. Bartel ... 14,352
Overshoes, ornamentation of, G. Watkinson ... 14,372
Pendant, B. Dreyfus ... 14,356
Skirt with sash drapery, Miss's kilt-plaited, J. Q. Reed ... 14,370
Target, J. A. H. Dressel ... 14,355
Trimming, Horwitz & Hepner ... 13,359

TRADE MARKS.

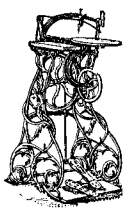
Base balls, A. J. Reach & Co ... 10,662
Bats, base-ball, A. J. Reach & Co ... 10,663
Biscuits, W. G. Wilson ... 10,671
Canned fruits, vegetables, and other articles of food, Franco-Californian Packing Company ... 10,658
Cigarettes, J. Huppmann ... 10,660
Cigarettes and cut tobacco, Sanderson & Co ... 10,664
Cigars, cigarettes, and smoking and chewing tobacco, Siegel Brothers ... 10,673
Gum, chewing, S. Coleman ... 10,649
Lamp chimneys, G. A. Macbeth & Co ... 10,653
Lamp chimneys and lantern globes, G. A. Macbeth & Co ... 10,652
Lard, J. Agostini ... 10,655
Lard, Chamberlain, Roe & Co ... 10,656, 10,657
Medicines, certain proprietary fluid, J. C. Mendenhall ... 10,651
Paper and envelopes of all kinds, writing, Z. Crane, Jr., & Bro ... 10,650
Paper boxes, G. W. Plumly & Son ... 10,654
Pianos, diminutive upright, G. Steck ... 10,674
Preservative for animal and vegetable substances, C. G. Am Ende ... 10,647
Razors, F. Ascheuer ... 10,665
Soap, hard, S. Winger ... 10,672
Tackle or pulley blocks, Bagnall & Loud ... 10,648
Tobacco, cigars, and cigarettes, smoking and chewing, Globe Tobacco Company ... 10,659
Tobacco, plug, J. H. Harris' Sons ... 10,666 to 10,670
Tools and implements for agricultural and mechanical purposes, H. W. Peabody & Co ... 10,661

A printed copy of the specification and drawing of any patent in the foregoing list, also of any patent issued since 1866, will be furnished from this office for 25 cents. In ordering please state the number and date of the patent desired, and remit to Munn & Co., 261 Broadway, New York. We also furnish copies of patents granted prior to 1866; but at increased cost, as the specifications, not being printed, must be copied by hand.

Canadian Patents may now be obtained by the inventors for any of the inventions named in the foregoing list, at a cost of $40 each. For full instructions address Munn & Co., 261 Broadway, New York. Other foreign patents may also be obtained.

Advertisements.

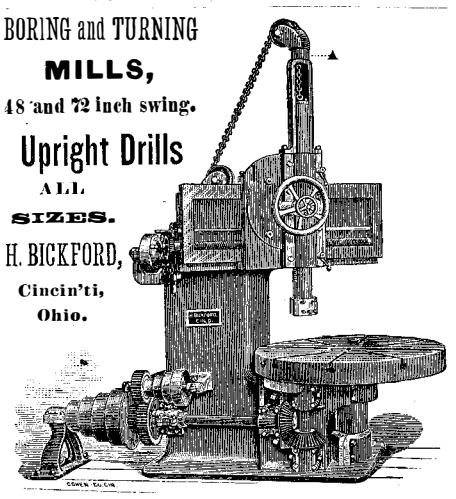
Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)
Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.



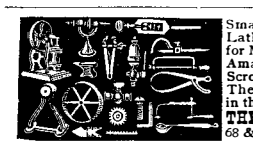
THE FLEETWOOD SCROLL SAW
is the Pioneer—it has been imitated but never equaled. The new No. 3, with recent improvements, surpasses all others.
THE DEXTER
is the lightest running, most durable and effective, low priced Scroll Saw in the market. Beware of cheap imitations of these machines. Send for circular. Prices $5 to $25.
TRUMP BROS. MACHINE CO., Wilmington, Del.

How to procure a good Achromatic Astronomical Telescope cheaply. Address REESE, 257 Kinzie St., Chicago.

BORING and TURNING MILLS,
48 and 72 inch swing.
Upright Drills
ALL SIZES.
H. BICKFORD,
Cincin'ti, Ohio.



TO ORGAN BUILDERS. PATENT FOR SALE.
An attachment for instantly transposing key. Portable or permanent. Address Dr. Guernsey, Frankford, Phila.



Small Engine Castings, Gears, Lathe Tools, Saw Blades, Tools for Mechanics Machinists and Amateurs, Engraving Tools, Scroll Saws, Skates, Bicycles, The largest stock of fine Tools in the U. S. Send for price-list.
THE JOHN WILKINSON CO., 68 & 70 Wabash Ave. Chicago

FOR SALE.—Patent No. 267,998, being an improvement in Treadles. Either entire, State rights, or on royalty. Address F. H. BURROWS, Box 577, Springfield, Ill.

Fine Taps and Dies, Bolt Cutters, and Labor-Saving Tools.

Wiley & Russell Mfg. Co., Greenfield, Mass.

GET THE BEST AND CHEAPEST.
TRADE PERIN MARK.
Silver Finish.
J. A. FAY & CO.
J. A. FAY & CO.,
(Cincinnati, Ohio, U. S. A.)
Exclusive Agents and Importers for the United States, of the
CELEBRATED
PERIN BAND SAW BLADES,
Warranted *superior to all others in quality, finish, uniformity of temper,* and *general durability.* One *Perin Saw* outwears *three* ordinary saws.

UNIVERSAL MILL.
The Newell
Pulverizes everything—hard, soft, gummy, etc. The best Clay Grinder and the best Cotton Seed Huller in the world.
Portable Steam Engines, Stationary Engines, Horizontal and Upright Boilers, all sizes, on hand for immediate delivery.
10 Barclay St., N. Y. City.

DESCRIPTIVE CIRCULAR & TESTIMONIALS SENT ON APPLICATION.
HALL & SONS, 340 WASHINGTON ST. BUFFALO N.Y.

SPRAY FEED WATER PURIFIER
FOR STEAM BOILERS
U.S. & FOREIGN PATENTS

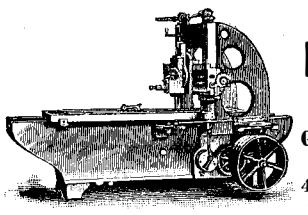
METAL WORKING MACHINERY
LATEST IMPROVEMENTS.
GOULD & EBERHARDT,
NEWARK, N. J.

Burgess' Blow Pipe Pump, invaluable to every intelligent metal worker, for Tempering, Brazing, Hard and Soft Soldering. Gives Gentlest Flame or Hottest Blast. $10. Circulars free. J. ELLIOTT SHAW, 154 S. Fourth St., Phila.

WANTED.—A first-class mechanical and hydraulic engineer as superintendent of a large manufacturing establishment. Must understand draughting and machinery. Address "Pumps," P. O. Box 2291, New York.

DEAFENING
FIRE AND VERMIN PROOF
Sample and Circular Free by mail.
U. S. MINERAL WOOL CO., 22 Courtlandt St., N. Y.

WANTED.—A First-class Foreman
to take charge of bridge shop. Must be thoroughly acquainted with all kinds of bridge manufacture. Address, with references, KANSAS CITY BRIDGE AND IRON CO., Kansas City, Mo.



26 in. x 26 in.
PLANER.
Send for new circular.
G. A. GRAY, Jr. & CO.,
42 East 8th St., Cincinnati, O.

SPEAKING TELEPHONES.
THE AMERICAN BELL TELEPHONE COMPANY,
W. H. FORBES, *President.* W. R. DRIVER, *Treasurer.* THEO. N. VAIL, *Gen. Manager.*
Alexander Graham Bell's patent of March 7, 1876, owned by this company, covers every form of apparatus, including Microphones or Carbon Telephones, in which the voice of the speaker causes electric undulations corresponding to the words spoken, and which articulations produce similar articulate sounds at the receiver. The Commissioner of Patents and the U. S. Circuit Court have decided this to be the true meaning of his claim; the validity of the patent has been sustained in the Circuit on final hearing in a contested case, and many injunctions and final decrees have been obtained on them.
This company also owns and controls all the other telephonic inventions of Bell, Edison, Berliner, Gray, Blake, Phelps, Watson, and others.
(Descriptive catalogues forwarded on application.)
Telephones for Private Line, Club, and Social systems can be procured directly or through the authorized agents of the company.
All telephones obtained except from this company, or its authorized licensees, are infringements, and the makers, sellers, and users will be proceeded against.
Information furnished upon application.
Address all communications to the
AMERICAN BELL TELEPHONE COMPANY,
95 Milk Street, Boston, Mass.

MALLEABLE AND FINE GRAY IRON ALSO STEEL CASTINGS FROM SPECIAL PATTERNS
THOMAS DEVLIN & CO. FINE TINNING JAPANNING AND FINISHING.
LEHIGH AVE. & AMERICAN ST. PHILA.

PATENTS.
MESSRS. MUNN & CO., in connection with the publication of the SCIENTIFIC AMERICAN, continue to examine improvements, and to act as Solicitors of Patents for Inventors.
In this line of business they have had *thirty-eight years' experience,* and now have *unequaled facilities* for the preparation of Patent Drawings, Specifications, and the prosecution of Applications for Patents in the United States, Canada, and Foreign Countries. Messrs. Munn & Co. also attend to the preparation of Caveats, Copyrights for Books, Labels, Reissues, Assignments, and Reports on Infringements of Patents. All business intrusted to them is done with special care and promptness, on very reasonable terms.
A pamphlet sent free of charge, on application, containing full information about Patents and how to procure them; directions concerning Labels, Copyrights, Designs, Patents, Appeals, Reissues, Infringements, Assignments, Rejected Cases, Hints on the Sale of Patents, etc.
We also send, *free of charge,* a Synopsis of Foreign Patent Laws, showing the cost and method of securing patents in all the principal countries of the world.
MUNN & CO., Solicitors of Patents,
261 Broadway, New York.
BRANCH OFFICE.—Corner of F and 7th Streets, Washington, D. C.

© 1883 SCIENTIFIC AMERICAN, INC

Vogdes' Architect's and Builder's Companion,
A NEW, ENLARGED, REVISED, AND CORRECTED EDITION,
JUST READY.

THE ARCHITECT'S AND BUILDER'S

Pocket Companion

AND PRICE BOOK.

Consisting of a short but comprehensive Epitome of Decimals, Duodecimals, Geometry, and Mensuration; with Tables of U. S Measures, Sizes, Weights, Strengths, etc., of Iron, Wood, Stone, Brick, Cement, and Concretes, Quantities of Materials in Given Sizes and Dimensions of Wood, Brick, and Stone; and full and complete Bills of Prices for Carpenter's Work and Painting. Also Rules for Computing and Valuing Brick and Brick Work, Stone Work, Painting, and Plastering, with a Vocabulary of Technical Terms, etc.

By FRANK W. VOGDES, Architect,
INDIANAPOLIS, IND.
ENLARGED, REVISED, AND CORRECTED.

In one volume, 368 pages, full bound, in pocket book form, $2.00; bound in muslin, $1.50. By mail, free of postage, to any part of the world.

☞ The above, or any of our books, sent by mail free of postage at the publication prices, to any address in the world.

☞ Our Catalogue of practical and Scientific Books, 96 pages, 8vo, and our Catalogue of Books on Steam and the Steam Engine, Mechanics, Machinery, and Dynamical Engineering, sent free, and free of postage, to any one in any part of the world who will furnish us with his address.

HENRY CAREY BAIRD & CO.,
INDUSTRIAL PUBLISHERS, BOOKSELLERS & IMPORTERS,
810 Walnut Street, Philadelphia, Pa.

DROP FORGINGS OF IRON OR STEEL
BEECHER & PECK, NEW HAVEN CONN.

ROOFING.

For steep or flat roofs. Applied by ordinary workmen at one-third the cost of tin. Circulars and samples free. Agents Wanted. T. NEW, 32 John Street, New York.

For New Roofs. *For Old Roofs.*

ROOFING

Price low: *anybody* can apply on Steep or Flat Surface; materials durable, Fireproof. Send *at once* for Illustrated Book. N. Y. Slate Roofing Co., Phila., Pa.

A GERMAN GENTLEMAN OF MEANS, with excellent connections, a graduated engineer, speaking French, English, and Italian, would like to engage in a large manufacturing business in this country, or act as an agent for the sale of American machinery in Europe. Address P. P., care Bates' Advertising Agency, 41 Park Row, New York.

THE ORCHESTRION HARMONETTE.

The most wonderful Musical Instrument in the world. *It combines both music and musician.* Novel in construction; elegant in design and decoration; powerful and melodious in effect; *more notes and plays better than $9 Organettes.* It plays any tune—dance, popular, or sacred—and **a little child can operate it.** A short strip of perforated paper represents the tune. Place the paper in the instrument, and turn the handle, *when it will play the tune perfectly.* It contains many patented improvements, and is the most perfect musical instrument in the market. **Price of Music, only 4 cents per foot.** Music can be sent by mail at any time. This is the most beautiful and acceptable present that can be made to any one. It will furnish music for any occasion, and **any one can play it.** Price, $8. **Special price to those wishing to act as our Agents, only $5.** Sent by express on receipt of price. Address, MASSACHUSETTS ORGAN CO., *the great headquarters* for all MUSICAL INSTRUMENTS, ORGANINAS, ORGANETTES, ARISTONS, TOURNAPHONES, CLARIONAS, etc. *Get our Catalogue and prices before buying elsewhere.* 57 Washington Street, Boston, Mass.

DYKE'S BEARD ELIXIR Forces luxuriant Mustache, Whiskers, or hair on bald heads in 20 to 30 days. No injury. Easily used. Beats the world. 2 or 3 Pkgs does the work. Will prove it or forfeit $100.00. Price per Package with directions sealed and postpaid 25 cents, 3 for 50 cts., stamps or silver. L. A. L. SMITH & CO., Agents, Palatine, Ill.

WONDERS

MUSICAL
OPTICAL
MAGICAL
ELECTRICAL
MECHANICAL

Our Mammoth Illustrated Catalogue of above and many other **marvelous** and **curious** things is a **wonder** in itself. Sent **FREE** on application.

AGENTS WANTED Illus. Catalogue of **MAGIC LANTERNS** 150 pages, including Photo. and Lecture, **10c.**

HARBACH ORGANINA CO.
809 FILBERT STREET, PHILADA., PA.

$5 to $20 per day at home. Samples worth $5 free. Address STINSON & Co., Portland, Me.

GUNS ShotGuns Revolvers, Rifles, Etc.

Large Ill. Catalogue free. Address Great Western GunWorks, Pittsburgh, Pa.

Found at Last GOLD SEEKERS FRIEND If you will send us TEN CENTS Silver, you'll get by mail our NEW CASE & CONTENTS that will help you to more READY CASH AT ONCE, than any other method in the world. It never fails. World M'f'g Co. 122 Nassau St. New York.

$66 a week in your own town. Terms and $5 outfit free. Address H. HALLETT & Co., Portland, Me.

---

50 Large New Gold, Silver, etc., Chromo Cards, no 2 alike, name on, 10c. L. Jones & Co., Nassau, N. Y.

IT PAYS to sell our Hand Rubber Stamps. Samples free. FOLJAMBE & Co., Cleveland, O.

FIRE BRICK TILE AND CLAY RETORTS ALL SHAPES BORGNER & O'BRIEN 23 1/2 ST. ABOVE RACE, PHILADELPHIA.

Rheumatism, Sciatica, and Lumbago. Can cure any case completely within twelve days. First-class parties only write. GEO. BLACKMAN, Montreal, Can.

OPIUM

Habit easily cured with **CHLORIDE OF GOLD**
LESLIE E. KEELEY, M.D., SURGEON, C. & A. R. R.
DWIGHT, Illinois.

RUPTURE

cured without an operation or the injury trusses inflict by Dr. J. A. SHERMAN'S method. Office, 251 Broadway, New York. His book, with Photographic likenesses of bad cases, before and after cure, mailed for 10c.

OPIUM HABIT DR. H. H. KANE, of the DeQuincey Opium Home, now offers a Remedy whereby any one **can cure himself at home quickly and painlessly.** For testimonials, and endorsements, letters from eminent medical men, and a full description of the treatment, address **H. H. KANE, A.M., M.D., 46 W. 14th St. New York.**

THE AJAX METAL Company, PHILA.

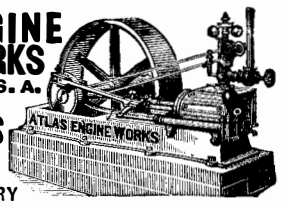
CLAMER'S AJAX METALS ESPECIALLY ADAPTED FOR RAILROADS ROLLING MILL & ENGINE BEARINGS, COCKS, VALVES &c

---

Send for Catalogue and Prices.

ATLAS ENGINE WORKS

INDIANAPOLIS, IND., U. S. A.
MANUFACTURERS OF
STEAM ENGINES AND BOILERS.



CARRY ENGINES and BOILERS IN STOCK for IMMEDIATE DELIVERY

WATCHMAKERS.

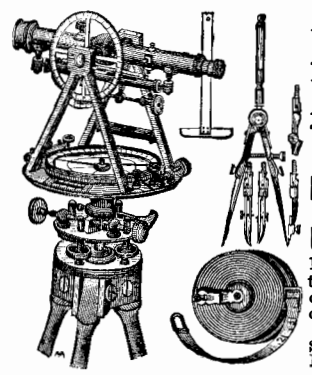
Before buying, see the Whitcomb Lathe and the Webster Foot Wheel, made by the AMERICAN WATCH TOOL CO., Waltham, Mass.

M'F'G OPTICIANS.

SURVEYING INSTRUMENTS: Transits, Levels, Compasses, Rods, Chains, Tapes.

DRAWING INSTRUMENTS, Separate and in cases. Scales, Angles, Curves, T-squares, **Microscopes,** Telescopes, Opera and Field Glasses, Magic Lanterns, **Aneroid and Mercurial Barometers,** Self-registering Thermometers, Hygrometers, Hydrometers, **Air Meters,** Pedometers, Odometers, Rhumkorff Coils, Batteries, Magnets, etc. Send for and specify (SA-catalogue), 192 pages.

MATHEMATICAL INSTRUMENTS



AND

Drawing Materials

The Largest AND BEST STOCK IN THE United States

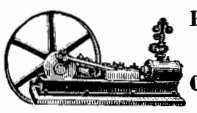
Prices and Illustrated Catalogue of 195 pages sent on application.

—ALSO—

Sample Books of Drawing Papers.

QUEEN & CO., Philadelphia

Horizontal Steam Engines,



For best Automatic Cut-off or Plain Slide Valve of Superior Design, Complete in Every Respect, ADDRESS

LAMBERTVILLE IRON WORKS,
LAMBERTVILLE, N. J.

THE

Colliau Patent Cupola.

Excels all others for economy of fuel and labor. Adapted to all classes of foundry work.

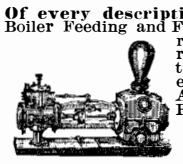
Awarded Silver Medal at Chicago Exposition.

Correspondence solicited and catalogues furnished on application.

COLLIAU FURNACE CO.,
Detroit, Mich.

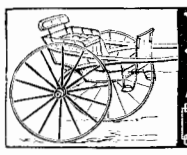
STEAM PUMPS

Of every description and for every purpose. Boiler Feeding and Fire Pumps a specialty. Pumping returns from steam heating apparatus without the use of tanks or traps. Combined Pumps and Boilers for Railway Water Stations. Adopted by twenty-four leading R. R. lines.



SMITH, VAILE & CO., Dayton, O.
Send for descriptive catalogue.

ON THE MOLECULAR RIGIDITY OF Tempered Steel.—By Prof. D. E. Hughes, F.R.S. An account of some experiments performed by the author in order to investigate the peculiar molecular structure of steel, as indicated by the induction balance. Description of the apparatus used in the experiments. Molecular disturbances in tempered steel under torsion. Difference of molecular rigidity in tempered steel and in iron. Mode of rendering the rigidity of steel visible. Effect of temper upon the rigidity of steel. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **375.** Price 10 cents. To be had at this office and from all newsdealers.



The BRADLEY ROAD CART

A LIGHT RUNNING EASY RIDING MODERATE PRICED TWO WHEELED VEHICLE. TEN STYLES AND WEIGHTS

EVERY OWNER OF A HORSE SHOULD SEND FOR OUR 20 PAGE ILLUSTRATED CIRCULAR AND PRICE LIST.

BRADLEY & CO. SYRACUSE, N.Y. ESTABLISHED 1832

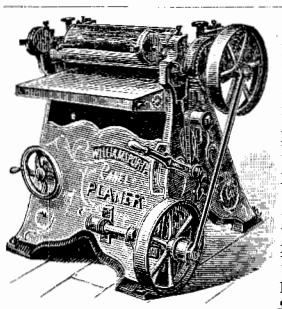
FOSSIL MEAL COMPOSITION,

The Leading Non-Conducting Covering FOR BOILERS, PIPES, ETC.

With ⅝ to ¾ inch thickness it radiates less heat than any other covering does with 2 inches.

Weighs very light, is very durable, fireproof, and is easily applied. Sold in a dry state by the pound.

FOSSIL MEAL CO., 48 Cedar St., New York.
Boston Agents, S. C. Nightingale & Childs, 128 Oliver St.



WILLIAMSPORT Pony or Panel Planer. For general use in Door Shops, Box and Furniture Manufactories. For planing Door Panels, Cigar Box Stuff, and Furniture work, it has no equal.

We use the Ellis Patent three part Journal Box and a solid forged steel head. Two pressure bars. Has strong feed. Will plane from 1-16 to 6 inch thick. Weight, 1,400 lb. The lowest priced first-class planer in the market. ROWLEY & HERMANCE, Williamsport, Pa.

THE BIGGEST THING OUT (new)

Illustrated Book Sent free.
E. NASON & CO., 120 Fulton St., New York.

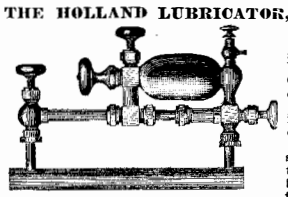
$72 A WEEK, $12 a day at home easily made. Costly Outfit free. Address TRUE & Co., Augusta, Me.

Rider's New and Improved COMPRESSION Hot Air Pumping Engine

New and Improved Designs.
INTERCHANGEABLE PLAN
MANUFACTURED BY
DELAMATER IRON WORKS,
C. H. DELAMATER & Co., Proprietors,
No. 16 CORTLANDT ST., NEW YORK, N. Y.

Our 10-Horse Spark-Arresting Threshing Engine has cut 10,000 feet pine lumber in 10 hours. Will burn wood six feet long, coal, straw, and cornstalks. Send for Price List and Catalogue "A 2."
B. W. PAYNE & SONS,
Box 1207. Corning, N. Y.

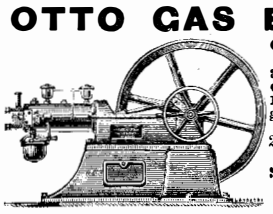
THE HOLLAND LUBRICATOR, VISIBLE, DROP,



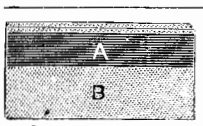
Is guaranteed to be
1. A perfect insurance against the cutting of Valve-seats, Cylinder and Governor Valves of the engine.
2. It will pay for itself in six months, in the saving of oil, coal, and packing.
3. It will insure more speed in the revolutions of the engine, say from one to two strokes per minute, thus increasing the power of the engine. M'f'd by Holland & Thompson, 217 River St., Troy, N.Y.

THE SCREW PROPELLER.—BY Adolph Count Buonaccorsi Pistoja. A historical sketch of the origin and progress of the screw as applied to navigation. Ressel the true inventor of the screw propeller. Principles of screw propulsion. The two kinds of screw propellers and their mode of working. The inventions of Sauvage, Smith, Woodcroft, Sollier, Lord Dundonald, Vergne, Holm, Mitchell, Maudslay, Hirsch, Kadaiz, Griffith, Jarrow, Thornycroft, etc. Illustrated with twenty-three figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **370.** Price 10 cents. To be had at this office and from all newsdealers.

OTTO GAS ENGINE



Over **10,000** in use. Burns common Gas and Air. No steam, no coal, no ashes, no fires, no attendance, no danger. Started at once. Sizes: 1, 2, 4, 7, 10, 15, 25 ind. H. P.
SCHLEICHER, SCHUMM & CO., Philadelphia and Chicago.



RUBBER BACK SQUARE PACKING.

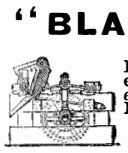
BEST IN THE WORLD.
For Packing the Piston Rods and Valve Stems of Steam Engines and Pumps.

B represents that part of the packing which, when in use, is in contact with the Piston Rod.
A, the elastic back, which keeps the part B against the rod with sufficient pressure to be steam-tight, and yet creates but little friction.
This Packing is made in lengths of about 20 feet, and of all sizes from ¼ to 2 inches square.

NEW YORK BELTING & PACKING CO.,
JOHN H. CHEEVER, Treas. **Nos. 13 & 15 Park Row, opp. Astor House, New York.**

"BLAKE'S CHALLENGE" ROCK BREAKER.

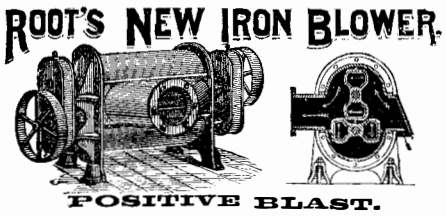
Patented November 18, 1879.



For **Macadam Road** making, Ballasting of **Railroads,** Crushing **Ores,** use of **Iron Furnaces,** etc. Rapidly superseding our *older styles* of Blake Crusher on account of its superior *strength, efficiency,* and *simplicity.* Adopted by important Railway and Mining Corporations, Cities, and Towns. First Class Medals of *Superiority* awarded by American Institute, 1879 and 1880.

BLAKE CRUSHER CO., Sole Makers, New Haven, Conn.

ROOT'S NEW IRON BLOWER.



POSITIVE BLAST.
IRON REVOLVERS, PERFECTLY BALANCED,
Has Fewer Parts than any other Blower.
P. H. & F. M. ROOTS, Manufacturers,
CONNERSVILLE, IND.
S. S. TOWNSEND, Gen. Agt., 22 Cortland St., 9 Dey St.,
COOKE & CO., Selling Agts., 22 Cortland Street,
JAS. BEGGS & CO., Selling Agts. 9 Dey Street,
NEW YORK.
SEND FOR PRICED CATALOGUE.

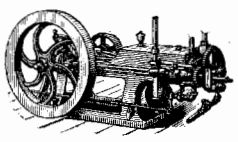
SEND TO LONDON, BERRY & ORTON PHILA PA FOR **THE BEST BAND SAW BLADE**

WANTED, DRAUGHTSMAN.

A competent and rapid draughtsman, thoroughly familiar with steam machinery; one acquainted with rolling mill or steel works draughting preferred. Apply, giving references and statement of experience, to WITHEROW & GORDON, Pittsburg, Pa., Post Office.

To one who suits this is a first-rate opening, as steady employment and good salary will be obtained.

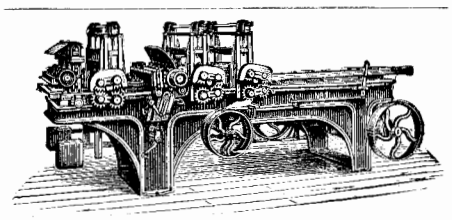
Gas Engines, ½ & 1 H. P., Now Ready.



For Power or For Pumping

GAS ENGINES,

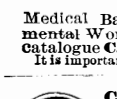
Simple, Substantial, Safe, Economical.
POWER DETERMINED BY ACTUAL TEST.
Call and see them, or for circulars and prices address
THE CONTINENTAL GAS ENGINE CO.,
No. 231 BROADWAY, NEW YORK.



WITHERBY, RUGG & RICHARDSON, Manufacturers of Patent Wood Working Machinery of every description. Facilities unsurpassed. Shop formerly occupied by R. Ball & Co., Worcester, Mass. Send for Catalogue.

Telegraph and Electrical SUPPLIES

Medical Batteries, Inventors' Models, Experimental Work, and fine brass castings. Send for catalogue **C. E. JONES & BRO. Cincinnati, O.**
It is important to us that you mention this paper.



Clark's Noiseless Rubber Wheels. Absolutely prevent splintering and wearing of floors caused by use of Iron Wheels. Adapted for Trucks, Boxes, Baskets, Tables, and work of every kind in Mills, Warehouses, Stores, etc. Catalogue free.
GEO. P. CLARK, Windsor Locks, Ct.

UNWRITTEN HISTORY AND HOW TO Read It.—By John Evans, D.C.L., LL.D., etc. A lecture to the working classes, delivered at the meeting of the British Association for the Advancement of Science, August, 1882, explaining how modern scientific methods are applied to the study of the manners and customs of remote antiquity. The study of history from coins, weapons, and armor. The stone, bronze, and iron ages. History in the contents of grave mounds. The lake dwellings. The contents of drift deposits, and what they teach. Antiquity of man. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **369.** Price 10 cents. To be had at this office and from all newsdealers.

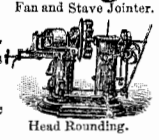
Chamfering, Howelling, and Crozing.

BARREL, KEG, HOGSHEAD, AND Fan and Stave Jointer.

Stave Machinery.

Over 50 varieties manufactured by
E. & B. HOLMES,
Buffalo, N. Y.

Truss Hoop Driving.



Head Rounding.

ON THE LIMITING NUMBER OF TEETH for Spur Wheels.—By Prof. C. W. MacCord, D.S. A new method of determining the limiting or least number of teeth that can be assigned to wheels in which the teeth are involute. Illustrated with four figures. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **370.** Price 10 cents. To be had at this office and from all newsdealers.

NOTICE to Users of Steam Pumps.
We have received following letter in regard to one of our No. 5 "L" ($16) Steam Jet Pumps elevating 1½ inch pipe of water more than 50 feet high:
"L'ANSE, MICH., Feb. 24, 1883.
"VAN DUZEN & TIFT, Cincinnati, O.:
"Money could not buy the Jet of us unless another could be had. I would not give your No. 5 "L" for a $700 pump, equal distance to raise.
"N. A. Litchfield, Supt. Mich. Slate Co."
We make Ten Sizes of these Pumps. Prices $7 to $75. Capacities 100 to 20,000 gallons per hour. State for what purpose wanted and send for Catalogue of "Pumps."
VAN DUZEN & TIFT, Cincinnati, O.

Syracuse Malleable Iron Works

PERFECT

NEWSPAPER FILE

The Koch Patent File, for preserving newspapers, magazines, and pamphlets, has been recently improved and price reduced. Subscribers to the SCIENTIFIC AMERICAN and SCIENTIFIC AMERICAN SUPPLEMENT can be supplied for the low price of $1.50 by mail, or $1.25 at the office of this paper. Heavy board sides; inscription "SCIENTIFIC AMERICAN," in gilt. Necessary for every one who wishes to preserve the paper.
Address
MUNN & CO.,
Publishers SCIENTIFIC AMERICAN.

© 1883 SCIENTIFIC AMERICAN, INC

Advertisements.

Inside Page, each insertion - - - 75 cents a line.
Back Page, each insertion - - - $1.00 a line.
(About eight words to a line.)

Engravings may head advertisements at the same rate per line, by measurement, as the letter press. Advertisements must be received at publication office as early as Thursday morning to appear in next issue.

MAGIC LANTERNS

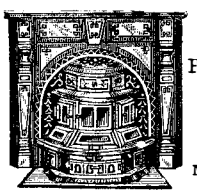
And **STEREOPTICONS**, all prices. Views illustrating every subject for **PUBLIC EXHIBITIONS**, etc. ☞ *A profitable business for a man with small capital.* Also Lanterns for home amusement. 116-page catalogue *free*. McALLISTER, Mfg. Optician, 49 Nassau St., N.Y.

COLUMBIA BICYCLES AND TRICYCLES.

New Illustrated (36 page) Catalogue, giving full description of these machines, sent for 3 cent stamp.
THE POPE M'F'G CO.,
597 Washington St., Boston, Mass.

BOOKS ON BUILDING, PAINTING, Decorating, etc. For 1883 eighty-eight-page illustrated Catalogue, address, inclosing three 3-cent stamps, WM. T. COMSTOCK, 6 Astor Place, New York.

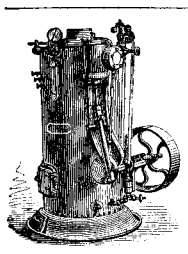
NEW HAVEN MANUFACTURING CO.
NEW HAVEN, CONN.,
MANUFACTURERS OF IRON WORKING
MACHINE TOOLS
Lathes, Planers, Drills, Shapers, etc.
ILLUSTRATED CATALOGUE ON APPLICATION.



BIBB'S
Celebrated Original
BALTIMORE
FIRE-PLACE HEATERS
To warm upper and lower rooms. The handsomest, most economical Coal Stoves in the world.
B. C. BIBB & SON
Foundry, Office and Salesrooms, 39 and 41 Light Street,
Baltimore, Md.
MARBLEIZED SLATE MANTELS.
☞ *Send for Circulars.*

SOUTHWARK FOUNDRY & MACHINE COMPANY,
430 Washington Avenue, Philadelphia,
Engineers & Machinists,
Blowing Engines and Hydraulic Machinery.
Sole makers of the
Porter-Allen Automatic Cut-Off Steam Engine.

GOLD MEDAL, PARIS, 1878.
BAKER'S
Breakfast Cocoa.
Warranted *absolutely pure Cocoa,* from which the excess of Oil has been removed. It has *three times the strength* of Cocoa mixed with Starch, Arrowroot or Sugar, and is therefore far more economical. It is delicious, nourishing, strengthening, easily digested, and admirably adapted for invalids as well as for persons in health.
Sold by Grocers everywhere.
W. BAKER & CO., Dorchester, Mass.

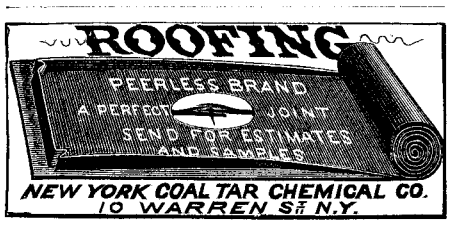


BOOKWALTER ENGINE.
Compact. Substantial. Economical, and easily managed; guaranteed to work well and give full power claimed. Engine and Boiler complete, including Governor, Pump, etc., at the low price of

3	HORSE POWER.....	$240 00
4½	" "	280 00
6½	" "	355 00
8½	" "	440 00

☞ Put on cars at Springfield, O.
JAMES LEFFEL & CO.,
Springfield, Ohio,
or 110 Liberty St., New York.

H.W.JOHNS'
ASBESTOS
ASBESTOS ROPE PACKING,
ASBESTOS WICK PACKING,
ASBESTOS FLAT PACKING,
ASBESTOS SHEATHINGS,
ASBESTOS GASKETS.
ASBESTOS BUILDING FELT.
Made of strictly pure Asbestos.
H. W. JOHNS M'F'G CO.,
87 Maiden Lane, New York,
Sole Manufacturers of H. W. Johns' Genuine
ASBESTOS LIQUID PAINTS, ROOF PAINTS, ROOFING, STEAM PIPE AND BOILER COVERINGS, FIREPROOF COATINGS, CEMENTS, ETC.
Descriptive price lists and samples free.



NEW YORK COAL TAR CHEMICAL CO.
10 WARREN St. N.Y.

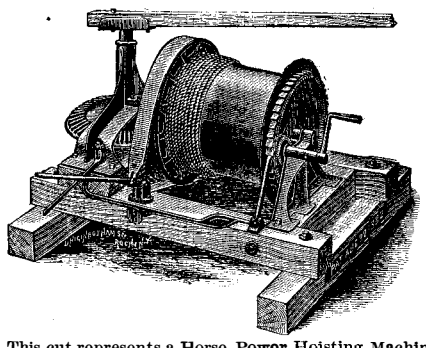
WM. A. HARRIS,
PROVIDENCE, R. I. (PARK STREET),
Six minutes walk West from station.
Original and Only builder of the
HARRIS-CORLISS ENGINE
With Harris' Patented Improvements, from 10 to 1,000 H. P.

ESTABLISHED 1855.
RUBBER BELTING, PACKING, HOSE.

Steam Packing, Piston Packing, Leading Hose, Steam Hose, Suction Hose, Pump Valves, Ball Valves, Gaskets and Rings,

Car Springs, Wagon Springs, Wringer Rolls, Grain Drill Tubes, Corrugated Rubber Matting
TRADE MARK.

Patent Red Strip Rubber Belting. PATENT CARBOLIZED RUBBER FIRE HOSE, Maltese Cross Brand. Over two million feet in use.
Baker Fabric Cotton-Lined Fire Hose. Linen Hose, Plain and Rubber-Lined.
GUTTA PERCHA & RUBBER M'F'G CO.,
28 Park Place, New York.

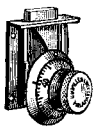


This cut represents a Horse Power Hoisting Machine for Railroad Contractors, Quarrymen, Mineral and Coal Miners, Masons, and Builders. Information furnished upon application. THE CONTRACTORS' PLANT M'F'G CO., 129 Erie St., Buffalo, N. Y.

NATIONAL STEEL TUBE CLEANER.
For cleaning Boiler Tubes. Saves its cost everytime it is used; indorsed by best Engineers.
Asbestos Materials, Fiber, Millboard, Packing, and Cement.
Address CHALMERS SPENCE COMPANY,
419 and 421 8th Street, New York.

SAWS 40,000 SAWS
EMERSON'S ILLUSTRATED SAWYERS HAND BOOKS (FREE) TO ANY PART OF THE WORLD.
FULL SIZE PLANER SAW TOOTH 5 CENTS EACH
ADDRESS EMERSON, SMITH & CO. BEAVER FALLS, PA

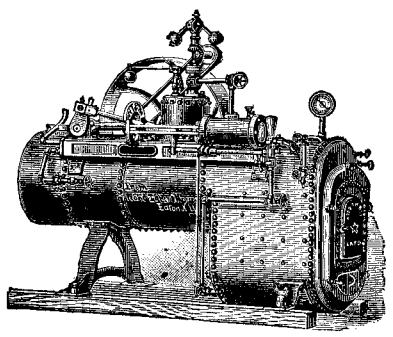
Double Screw, Parallel, Leg Vises.
Made and WARRANTED *stronger* than any other Vise by EAGLE ANVIL WORKS only, Trenton, N. J.



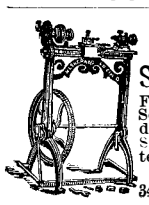
STEMWINDING Permutation Lock, No. 125. For *any* Till, Desk, Drawer, or Closet. Owner may use either 1, 2, 3, or 4 of its 50 numbers. *Millions* of changes equally possible and easy. Security unrivaled. Simple, durable, nickel plated. Send $2.50 for sample by mail, or stamp for Illustrated List of Locks, Tills, and Padlocks. D. K. Miller Lock Co., Phila., Pa.

Useful Information and Tables on Steam and Water for Engineers and others contained in Blake's new illustrated catalogue of steam pumps and pumping engines, just published. Copies sent free. Address Geo. F. Blake Mfg. Co., 95 & 97 Liberty St., New York.

WESTON DYNAMO-ELECTRIC MACHINE
The undersigned, sole agents for the above machine for
ELECTROPLATING AND ELECTROTYPING,
refer to all the principal Stove Manufacturers, Nickel and Silver Platers in the country. Over 1,500 now in use. Are also manufacturers of **Pure Nickel Anodes, Nickel Salts, Polishing Compositions** of all kinds, and every variety of supplies for Nickel, Silver, and Gold Plating; also, Bronze and Brass Solutions. Complete outfits for plating. Estimates and catalogues furnished upon application.
HANSON VANWINKLE & Co.
SOLE AGENTS NEWARK, N. J.
New York Office, 92 and 94 Liberty St.

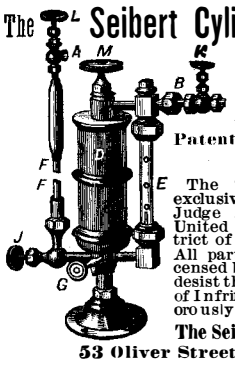


WOOD, TABER & MORSE,
Eaton, Madison Co., N. Y.,
MANUFACTURERS OF
PORTABLE AND AGRICULTURAL
Steam Engines
Of the HIGHEST STANDARD, in every respect, of materials and workmanship. Were pioneers in the manufacture of
Practically Portable Steam Engines,
And with determined policy to build only the BEST MACHINERY from the BEST MATERIALS, and in the BEST MANNER OF CONSTRUCTION, and with continued improvements, have attained the HIGHEST STANDARD in excellence of workmanship, simplicity of design, and capacity of power. For a quarter of a century have maintained their manufacture, the
Standard Portable and Agricultural Engines
of the world. Descriptive Circulars sent on application. Mention this paper.



SHEPARD'S CELEBRATED
$60
Screw Cutting Foot Lathe.
Foot and Power Lathes, Drill Presses, Scrolls, Saw Attachments, Chucks, Mandrels, Twist Drills, Dogs, Calipers, etc. Send for catalogue of outfits for amateurs or artisans. Address
H. L. SHEPARD & CO.,
341 & 343 West Front St., Cincinnati, O.

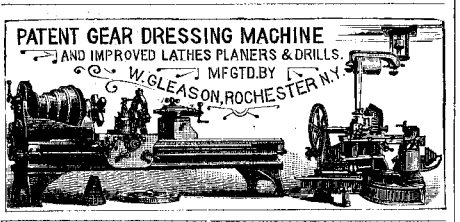
The **Seibert Cylinder Oil Cup Co.,**



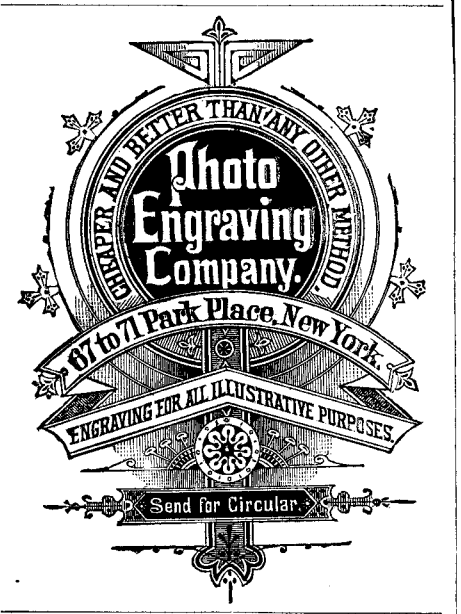
Manufacturers of **Oil Cups for Locomotive, Marine and Stationary Engine Cylinders,** under the **Seibert** and **Gates Patents, with Sight Feed.**

TAKE NOTICE.
The "Sight Feed" is owned exclusively by this company. See Judge Lowell's decision in the United States Circuit Court, District of Massachusetts, Feb. 23, '82. All parties, except those duly licensed by us, are hereby notified to desist the use, manufacture, or sale of Infringing Cups, as we shall vigorously pursue all infringers.
The Seibert Cylinder Oil Cup Co.,
53 Oliver Street, Boston, Mass.

TELESCOPES *Microscopes, Photographic Outfits* for amateurs, *Opera Glasses, Spectacles, etc.* R. & J. BECK, Manufacturing Opticians, Philadelphia, Pa.
☞ Send for **Illustrated Price Catalogue.**



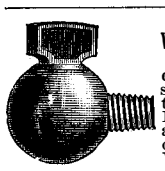
PNEUMONIA. — BY FRANCIS DELAFIELD, M.D. The four varieties of pneumonia. The acute lobar pneumonia of adults. Congestion, gray hepatization, red hepatization, and resolution. Etiology of lobar pneumonia. Physical signs of the disease. Complications. The course of the disease. Cerebral cases. The pneumonia of old people. Typhoid pneumonia. The fatal cases of pneumonia. Duration, prognosis, and treatment. Contained in SCIENTIFIC AMERICAN SUPPLEMENT, No. **377.** Price 10 cents. To be had at this office and from all newsdealers.


CHEAPER AND BETTER THAN ANY OTHER METHOD
Photo Engraving Company.
67 to 71 Park Place, New York.
ENGRAVING FOR ALL ILLUSTRATIVE PURPOSES
Send for Circular.

ROLLSTONE VARIETY LATHE.

Latest improved. Rotary and Stationary Bed Planers and Buzz Planers; Band Saws; *Wardwell's Patent Saw Bench* Dowel Machine; Chair Machinery; Boiler Machines, etc. *Also large Stock of Second hand Machinery always on hand.* Send for catalogue, and state just what you want, to ROLLSTONE MACHINE Co., 48 Water St., Fitchburg, Mass.

Pat. Jan. 25, '75. Pat. July 27, '75.
THE
Shimer Cutter Heads
10,000 SOLD.
To work Car Siding, Flooring, Ceiling, and Ship Lap. To Mould Doors, Sash, and Blinds. Cope Heads to match.
Shimer & Co.,
Milton, Pa.
Re-issued Oct. 12, '80 & Pat. July 18, '82.

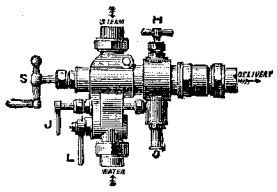


A PRACTICAL SUCCESS.
VAN DUZEN'S PAT. LOOSE PULLEY OILER.
Thousands in satisfactory everyday use. Entire reliability and constancy demonstrated in a two years' test by (would be) Eastern skeptics. Economy shown by reasonable prices and perfect performance. Send for our "Catalogue No. 55."
VAN DUZEN & TIFT, Cincinnati, O.

Pyrometers. For showing heat of Ovens, Hot Blast Pipes, Boiler Flues, Superheated Steam, Oil Stills, etc.
HENRY W. BULKLEY, Sole Manufacturer,
149 Broadway, New York.

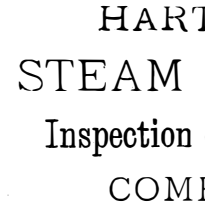
WIRE ROPE
Address JOHN A. ROEBLING'S SONS, Manufacturers, Trenton, N. J., or 117 Liberty Street, New York.
Wheels and Rope for conveying power long distances. Send for circular.

The "MONITOR."
A NEW LIFTING AND NON-LIFTING INJECTOR.



Best Boiler Feeder in the world. Greatest Range yet obtained. Does not Break under Sudden Changes of Steam Pressure.
Also Patent
EJECTORS
OR
Water Elevators,
For Conveying Water and Liquid.
Patent Oilers, Lubricators, etc.
NATHAN & DREYFUS,
Send for catalogue. 92 & 94 Liberty St., New York.

HARTFORD
STEAM BOILER
Inspection & Insurance
COMPANY.
W. B. FRANKLIN, V. Pres't. J. M. ALLEN, Pres't.
J. B. PIERCE, Sec'y.



F. Brown's Patent
FRICTION CLUTCH.
Send for Illustrated Catalogue and Discount Sheet to
A. & F. BROWN, 43 Park Place, New York.

SHAFTS PULLEYS HANGERS

DORMAN'S PRINTING PRESSES
BEAT THE WORLD.
Send Stamps for Catalogue and state size of Press wanted. Address J. F. W. DORMAN, 21 GERMAN ST., BALTIMORE.

PROSPECTUS
OF THE
Scientific American
FOR 1883.
The Most Popular Scientific Paper in the World.

Only $3.20 a Year, including postage. Weekly. 52 Numbers a Year.

This widely circulated and splendidly illustrated paper is published weekly. Every number contains sixteen pages of useful information, and a large number of original engravings of new inventions and discoveries, representing Engineering Works, Steam Machinery, New Inventions, Novelties in Mechanics, Manufactures, Chemistry, Electricity, Telegraphy, Photography, Architecture, Agriculture, Horticulture, Natural History, etc.

All Classes of Readers find in the SCIENTIFIC AMERICAN a popular *resume* of the best scientific information of the day; and it is the aim of the publishers to present it in an attractive form, avoiding as much as possible abstruse terms. To every intelligent mind, this journal affords a constant supply of instructive reading. It is promotive of knowledge and progress in every community where it circulates.

Terms of Subscription.—One copy of the SCIENTIFIC AMERICAN will be sent for *one year*—52 numbers—postage prepaid, to any subscriber in the United States or Canada, on receipt of **three dollars and twenty cents** by the publishers; six months, $1.60; three months, $1.00.

Clubs.—One extra copy of the SCIENTIFIC AMERICAN will be supplied gratis *for every club of five subscribers* at $3.20 each; additional subscribers at same proportionate rate.

One copy of the SCIENTIFIC AMERICAN and one copy of the SCIENTIFIC AMERICAN SUPPLEMENT will be sent for one year, postage prepaid, to any subscriber in the United States or Canada, on receipt of *seven dollars* by the publishers.

The safest way to remit is by Postal Order, Draft, or Express. Money carefully placed inside of envelopes, securely sealed, and correctly addressed, seldom goes astray, but is at the sender's risk. Address all letters and make all orders, drafts, etc., payable to

MUNN & CO.,
261 Broadway, New York.

To Foreign Subscribers.—Under the facilities of the Postal Union, the SCIENTIFIC AMERICAN is now sent by post direct from New York, with regularity, to subscribers in Great Britain, India, Australia, and all other British colonies; to France, Austria, Belgium, Germany, Russia, and all other European States; Japan, Brazil, Mexico, and all States of Central and South America. Terms, when sent to foreign countries, Canada excepted, $4, gold, for SCIENTIFIC AMERICAN, one year; $9, gold, for both SCIENTIFIC AMERICAN and SUPPLEMENT for one year. This includes postage, which we pay. Remit by postal order or draft to order of
MUNN & CO., 261 Broadway, New York.

PRINTING INKS.
THE "Scientific American" is printed with CHAS. ENEU JOHNSON & CO.'S INK. Tenth and Lombard Sts. Phila., and 47 Rose St., opp. Duane St., N. Y.

© 1883 SCIENTIFIC AMERICAN, INC